Self-Diagnostics - 1.9L Turbo Diesel - Beetle, Golf & Jetta (Engine Code ALH)

INTRODUCTION

NOTE: **Before starting work on vehicle read Service Precautions. See SERVICE PRECAUTIONS .**

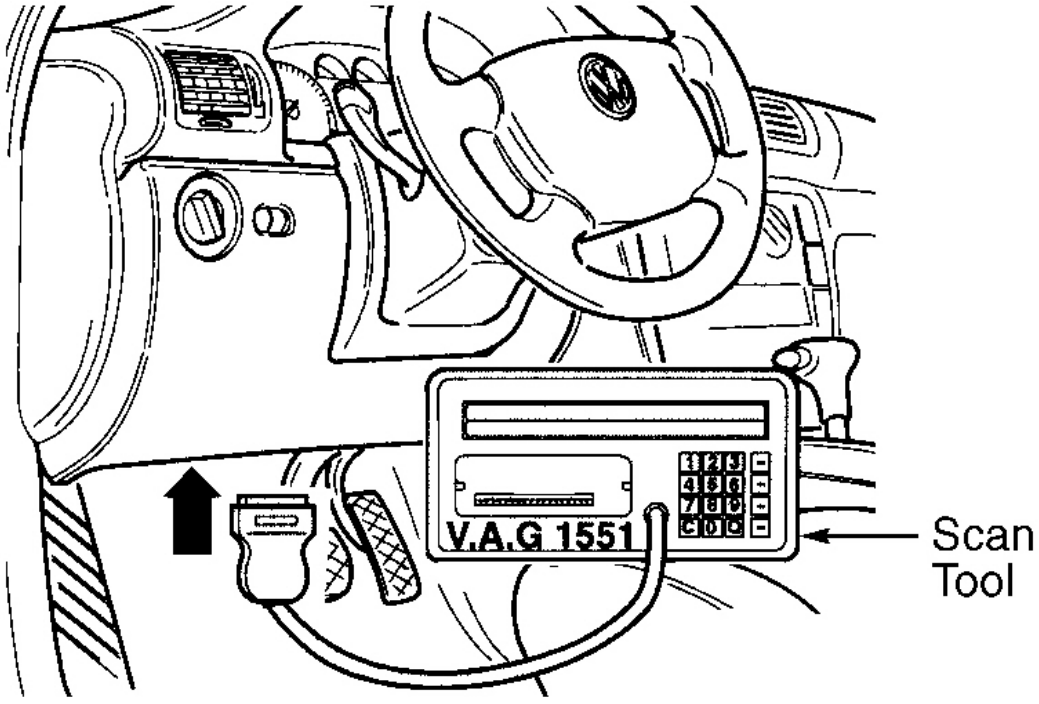
NOTE: **To properly diagnose vehicle, vehicle manufacturer recommends use of Scan Tool (VAG 1551/VAG 1552, VAS 5051/VAS 5052) and Test Box (VAG 1598). Generic scan tools may not be able to perform all functions that are necessary e.g. Readiness Code, Idle Check and Automatic Test Sequence etc. All voltage tests should be performed with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless specifically stated differently in testing procedures. Ensure ignition switch is in OFF position when performing resistance tests.**

SELF DIAGNOSTIC SYSTEM

NOTE: **Read and record DTCs before starting diagnostic work, some testing procedures will set DTC(s).**

NOTE: **When voltage supply to Engine Control Module (ECM) is interrupted, ECM retains Diagnostic Trouble Codes (DTCs), but loses all "learned" and "basic" values. Serious driveability problems may occur depending on vehicle mileage. After reconnecting ECM, it is necessary to perform relearn procedure. See TEST DRIVE RELEARN PROCEDURE .**

ECM stores DTC(s) related to fuel injection, ignition and emissions systems. If a malfunction occurs, it will be indicated by Malfunction Indicator Light (MIL) in instrument cluster. DTCs can be read using scan tool connected to Data Link Connector (DLC). See **Fig. 1** .



G98A11411

Fig. 1: Locating Data Link Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

MALFUNCTION INDICATOR LIGHT (K83) GLOW PLUG LIGHT (K29)

All models are equipped with a Malfunction Indicator Light (MIL). MIL illuminates when a system failure has been detected and DTC has been stored in Engine Control Module (ECM) memory. For location of MIL and Glow Plug Light. See **Fig. 2** and **Fig. 3** .

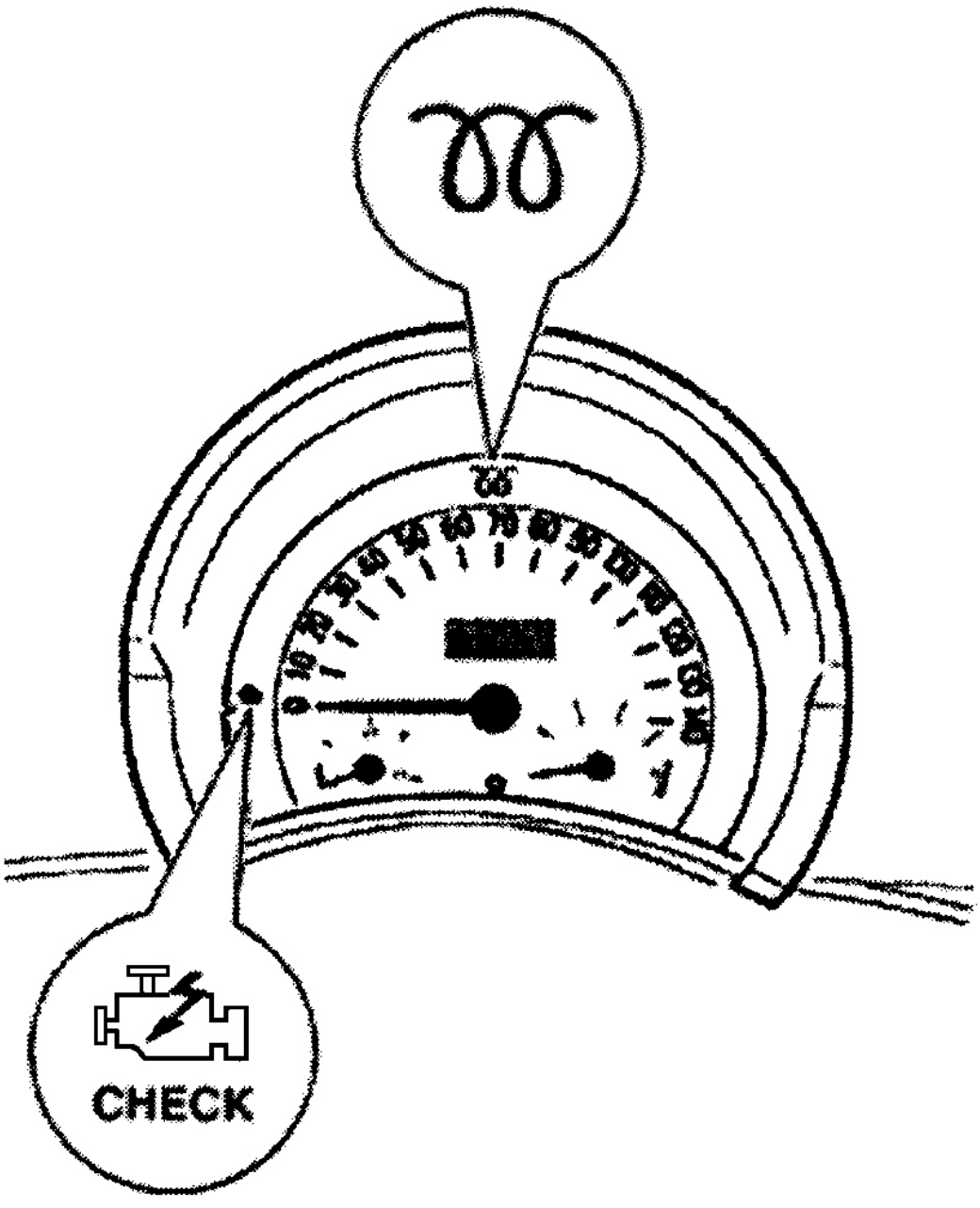


Fig. 2: Locating MIL & Glow Plug Lights (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

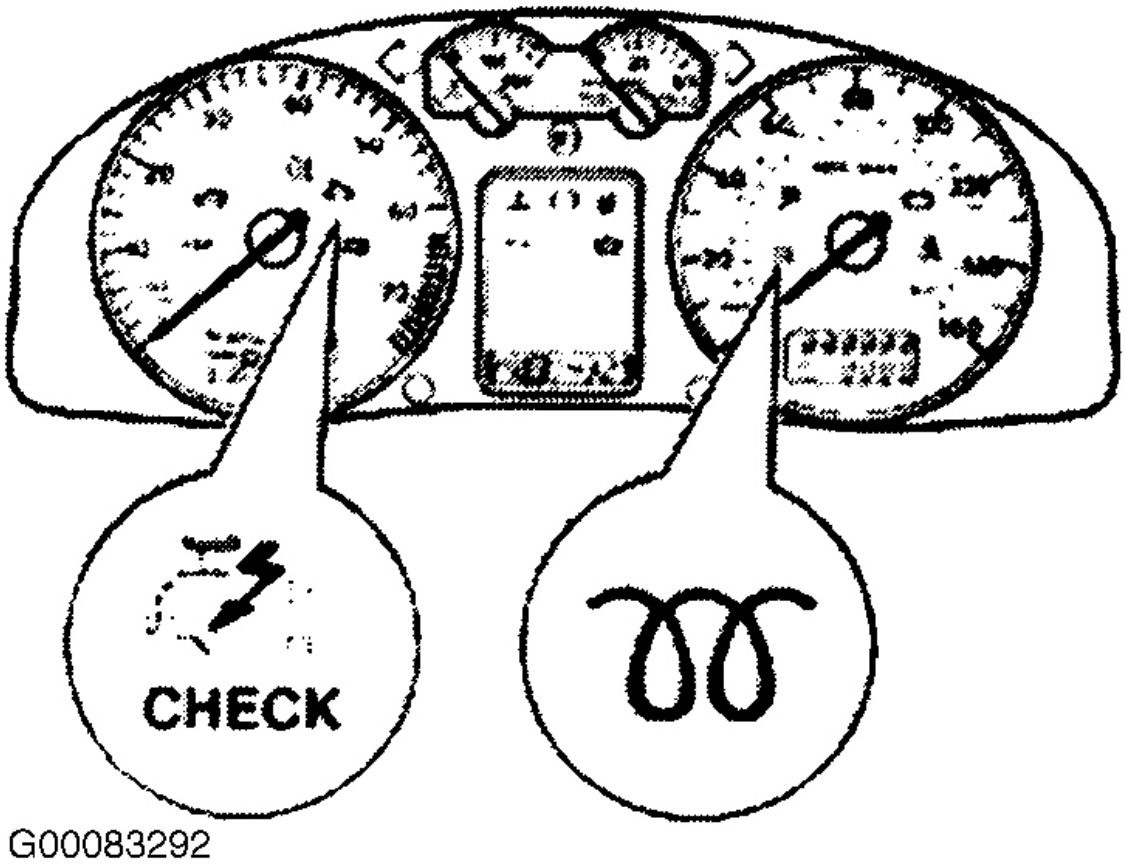


Fig. 3: Locating MIL & Glow Plug Lights (Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

SERVICE PRECAUTIONS

WARNING: For safety during road test, it is advisable to have a helper operate tester from rear seat. If test and measuring instruments are operated from front passenger's seat and vehicle is involved in an accident, there is a possibility the person sitting in this seat may receive serious injuries when air bag is deployed.

WARNING: Steam can be released when removing the cap from coolant expansion tank. Cover cap with a cloth and open carefully.

- Thoroughly clean all unions and the adjacent areas before disconnecting any part of fuel supply/injection system.
- Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths.
- Carefully cover opened components or seal, if the repair cannot be carried out immediately.
- When fuel supply/injection system is open, do not work with compressed air if it can be avoided. Do not move the vehicle unless absolutely necessary.
- Only install clean components.

- Make sure that no diesel fuel contacts the coolant hoses. Clean or replace affected hoses immediately.
- Turn ignition off when connecting or disconnecting test equipment, unless specifically instructed not to do so in repair instructions.
- Turn ignition off before connecting or disconnecting ECM (J248) connectors.
- Perform all resistance and voltage tests with a Digital Volt-ohmmeter (DVOM) with minimum 10-megohm impedance, unless stated otherwise in test procedures.
- Ensure ignition switch is in OFF position when performing resistance tests.

VISUAL INSPECTION

Perform a comprehensive visual inspection of underhood components. Check ground connections located on intake manifold, ground cable between engine and vehicle body and that battery cables are clean and tight. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

Check electrical wiring and harness connectors for damage and corrosion. Repair as necessary. Ensure all engine systems not related to ECM are operating properly. Check for any Technical Service Bulletins (TSBs) that may apply. DO NOT proceed with testing unless all engine problems not related to ECM have been repaired. Connect scan tool. See **Fig. 1** .

Check ECM for DTCs, following scan tool manufacture's instructions. If DTC(s) are present, see **DIAGNOSTIC TROUBLE CODE DEFINITIONS** . If no DTC(s) are present check suspect component using Output Diagnostic Test Mode (if Output Diagnostic Test Mode is available for the suspect component). See **OUTPUT DIAGNOSTIC TEST MODE** .

AUTOMATIC TEST SEQUENCE (FUNCTION 00)

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like harness connector disconnected). Automatic Test Sequence is function 00 when using Scan Tool VAG 1551/1552 or VAS 5051/5052.

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for entering AUTOMATIC TEST SEQUENCE.

Scan Tool VAG 1551/1552 or VAS 5051/5052

1. Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** .
2. To enter Automatic Test Sequence, press "0" key 2 times for address word "Automatic test sequence" and enter by pressing "Q" key. VAG 1551/1552 or VAS 5051/5052 communicates with all control modules in CAN Data Bus. Any DTCs that are stored will be displayed or "No DTC recognized" will display for each control module one after another. Automatic test sequence has ended when, "VAG On Board

Diagnostic HELP 1 - Rapid data transfer 2 - Flash code output" is displayed. Erase DTCs. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** . Perform test drive. See **TEST DRIVE RELEARN PROCEDURE** . Go to next step.

3. If no DTCs are stored after test drive, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. If DTC(s) are stored in a control module in CAN Data Bus, see appropriate DTC table and diagnostic procedure, (e.g. ABS DTC IDENTIFICATION table, under appropriate BRAKES/ANTI-LOCK/TRACTION CONTROL article, if ABS DTC is stored). Repair as necessary.
4. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform test drive. See **TEST DRIVE RELEARN PROCEDURE** .

RETRIEVING DIAGNOSTIC TROUBLE CODES (FUNCTION 02)

NOTE: Read and record DTCs before starting diagnostic work, some testing procedures will set DTCs. If no DTCs are stored, do not erase memory, erasing DTC memory will cause readiness code to be erased. If ignition is switched off between "Retrieving Diagnostic Trouble Codes" and "Clearing Diagnostic Trouble Codes" the DTC memory will not be erased, repeat "Retrieving Diagnostic Trouble Codes" procedure.

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like a harness connector disconnected). See AUTOMATIC TEST SEQUENCE (FUNCTION 00) .

NOTE: Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Generic scan tool may not be able to perform all test functions. If engine does not start, (this test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052) connect scan tool. Operate starter for approximately 6 seconds, do not switch ignition off. Turn on scan tool printer. Operate scan tool, according to scan tool display information. Check for DTCs.

When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be a loose harness connector or an intermittently open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTCs will be erased from ECM memory. A warm-up phase is engine started with coolant temperature below 122°F (50°C), and is switched off above 162°F (72°C).

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for reading DTCs. To identify DTCs, see **DIAGNOSTIC TROUBLE CODE DEFINITIONS** . After performing DTC checks and repair work, malfunctions may be present in other control modules such as harness connector disconnected. DTC memories of all control modules

must be checked and erased. See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** .

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Start engine and idle.
2. Using Scan Tool VAG 1551/1552 or VAS 5051/5052 start engine and press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "2" for "Check DTC memory" and enter by pressing "Q" key.
3. If DTCs are present, record or print DTCs. Press keys "0" and "5" for function "Erase DTC memory" and enter by pressing "Q" key. Press right arrow key, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. To identify DTCs, see **DIAGNOSTIC TROUBLE CODE DEFINITIONS** . Repair as necessary. If no DTCs are present "No DTC recognized" will display. Press right arrow key, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.
4. After performing DTC checks and repair work, malfunctions may be present in other control modules such as harness connector disconnected.
5. DTC memories of all control modules must be checked and erased. This sequence when using Scan Tool VAG 1551/1552 or VAS 5051/5052. See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** .
6. If no DTCs are present or after clearing diagnostic trouble codes from all control modules, perform a long road test. Coolant temperature needs to be greater than 176°F (80°C). Idle, partial throttle, full throttle and overdrive, must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. After road test recheck all control modules for DTCs. If DTCs are present, repair as necessary. Clear codes. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** . Verify repairs. Test is complete.

CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like e.g. harness connector disconnected). See AUTOMATIC TEST SEQUENCE (FUNCTION 00) .

NOTE: If ignition is switched off between "Retrieving Diagnostic Trouble Codes" and "Clearing Diagnostic Trouble Codes" the DTC memory will not be erased, repeat "Retrieving Diagnostic Trouble Codes" procedure.

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for clearing DTCs.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** .

DTCs must be read before being erased. See **RETRIEVING DIAGNOSTIC TROUBLE CODES (FUNCTION 02)** . If using Scan Tool VAG 1551/1552 or VAS 5051/5052, start engine. Press keys "0" and "1" for address word "Engine Electronics". Press keys "0" and "5" for function "Erase DTC memory," and enter by pressing "Q" key. Press keys "0" and "6" for function "End Output", and enter by pressing "Q" key.

TEST DRIVE RELEARN PROCEDURE

NOTE: When voltage supply to ECM is interrupted or diagnostic trouble codes have been cleared, ECM loses all "learned" and/or "basic" values. Serious driveability problems may occur depending on vehicle mileage. A relearn procedure must be performed.

1. If ECM was disconnected during diagnostic procedure or diagnostic trouble codes have been cleared, go to next step. If ECM was not disconnected during diagnostic procedure and no codes are present. Perform a test drive. Recheck for codes (no relearn procedure is necessary).
2. Turn ignition off. Remove test equipment. Reconnect ECM connector. Reconnect all remaining (disconnected) electrical connectors/components. Go to next step.
3. **NOTE: Throttle Valve Control Module (J338) adapts to ECM (J220) automatically if ignition is switched on for 10 seconds or more without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.**

   Turn ignition on for a minimum of 10 seconds. Turn ignition off. Perform a long road test. Coolant temperature needs to be greater than 176°F (80°C). Idle, partial throttle, full throttle and overdrive, all must be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. Read readiness code. Generate readiness code if necessary. See **READINESS CODE** .

READINESS CODE

Reading Readiness Code

Read readiness code in display zone 2. Specified value X000XXXX. Read readiness code in display zone 4. Specified value 0XXXXXXX. Press (arrow right) button. Press keys "0" and "6" to end data transfer function. Press "Q" button to enter input. If readiness code specifications are not attained in display zones 2 and 4. Repeat generating readiness code procedure. See **GENERATING READINESS CODE** .

Generating Readiness Code

1. After reconnecting ECM, it is necessary to perform relearn procedure, see **TEST DRIVE RELEARN PROCEDURE** . No DTCs stored. Engine coolant 50°F (10°C) minimum.
2. **NOTE: If test sequence is interrupted or not adhered to, readiness code will not**

be set.

Let engine idle for a minimum of 35 seconds.

3. Road test vehicle and maintain 2000 RPM in 3rd gear for a minimum of 5 seconds.
4. Accelerate from engine speed of 2200 RPM to wide open throttle in 2nd or 3rd gear for 8 seconds. Switch off engine and wait a minimum of 10 seconds. Repeat steps 2, 3 and 4.
5. Read readiness code. Start engine and let idle. Press keys "0" and "1". Press "Q" button to enter input. Rapid data transfer. Input display group number "XX" will appear. Press keys "0" and "8". Press "Q" button to enter input. Read measuring value block. Input display group number "XXX" will appear. Press "0", "1" and "7" buttons to select display group "17". Press "Q" button to enter input. Read measuring value block "17" will appear. Read readiness code in display zone 2. Specified value X000XXXX. Read readiness code in display zone 4. Specified value 0XXXXXXX. Press (arrow right) button.
6. Press keys "0" and "6" to end data transfer function. Press "Q" button to enter input. If readiness code specifications are not attained in display zones 2 and 4. Repeat readiness code procedure, go to step 1 .

OUTPUT DIAGNOSTIC TEST MODE

NOTE: Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Generic scan tool may not be able to perform all test functions. Output Diagnostic Test Mode (DTM) can be aborted by pressing "C" key. DTM will be aborted after 60 seconds, if right arrow key is not pressed again.

NOTE: When using scan tool in DTM to activate engine components, some components may be barely audible. Check component by touch or use mechanics stethoscope if necessary.

Output Diagnostic Test Mode (Generic Scan Tool)

Turn ignition off. Connect scan tool to DLC. See **Fig. 1** . Follow scan tool manufacturer instructions for entering OUTPUT DIAGNOSTIC TEST MODE.

Output Diagnostic Test Mode (Scan Tool VAG 1551/1552 or VAS 5051/5052)

1. Connect scan tool to DLC. See **Fig. 1** .
2. Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "3" for DTM and enter by pressing "Q" key. During DTM sequence individual components will be activated until advancing to the next component by pressing arrow key. It is possible to skip a component by pressing right arrow key more than once. When finished, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.
3. Activation sequence of components may vary, depending on current ECM version. Vehicle need to be at a room temperature higher than 59°F (15°C). A/C needs to be switched on, with highest blower speed and coolest temperature settings selected. A/C test step is displayed on vehicles without A/C; when this occurs go to next component. Output Diagnostic Test Mode activates each component for 30 seconds or right arrow button can be pushed to activate next component.

Output Diagnostic Test Mode for 1.9L Turbo Diesel activates the following components in given sequence:

- Cold Start Injector (N108) - Engine running at idle, activation should make a change in combustion that can be heard.
- EGR Vacuum Regulator Valve (N18) - Engine running at idle, activation should make a change in combustion that can be heard.
- A/C Compressor Interruption - Engine running at idle, activation should cycle A/C clutch at approximately 5 second intervals.
- Fuel Cut-off Valve (N109) - Engine running at idle, activation should stall the engine.
- Wastegate Bypass Regulator Valve (N75)
- Glow Plug Relay (J52)
- Glow Plug Indicator Light (K29) - Glow Plug Indicator Light (K29) should flash.
- Low Heat Output Relay (J359) - For coolant preheating, M/T only, (relay should click).
- High Heat Output Relay (J360) - For coolant preheating, M/T only, only (relay should click).
- MIL (K83) - MIL should flash.

FUNCTION 08 - READ MEASURING VALUE BLOCK

Different control modules can transmit a variety of test data. Test data provides information on the operating condition of the system and/or its sensors. Diagnostic function "08 - READ MEASURING VALUE BLOCK" allows scan tool to display test data using display group numbers. Test data can provide support in diagnosing and correcting malfunctions.

Before entering diagnostic function "08 - READ MEASURING VALUE BLOCK" run engine until coolant temperature is 176°F (80°C) or more. A/C is switch off. Transaxle is in Park or Neutral. Turn steering wheel until front wheels are in straight line. Connect VAS 5051 or equivalent scan tool to DLC. DLC is located behind cover under left side of steering column.

Turn ignition on or start engine as necessary for testing procedure. Using scan tool, select vehicle system "01 - ENGINE ELECTRONICS". Select diagnostic function "08 - READ MEASURED VALUE BLOCK". Press "Q" button to confirm input, and enter appropriate 3-digit group number in button field 2. Follow scan tool instructions to display desired test data.

ECM GROUND & VOLTAGE SUPPLY

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure battery and engine to body grounds are okay. Repair as necessary. Turn off all electrical consumers and A/C. Shift lever in park (A/T) or neutral (M/T). Set parking brake. Battery voltage must a minimum of 11.5 volts. Start engine and idle.
2. Check battery, alternator, parasitic load and ECM grounds. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Repair as necessary. If repairs where performed, repeat step 1 . If battery, alternator, parasitic load and ECM grounds are okay, go to step, go to next step. If battery, alternator, parasitic load and ECM grounds are okay, go to step 4 .
3. Possible cause is alternator and/or voltage regulator failure. Repair as necessary. If repairs were

performed, repeat step 1 . If alternator and voltage regulator are okay, go to next step.

4. Turn ignition off. Connect Test Box (VAG 1598/31) to ECM harness connector, leave ECM disconnected from test box. See **CONNECTING VAG TEST BOX** and go to next step.

NOTE: If test box is not available, use wiring diagram and DVOM to check ECM grounds and voltage supply. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

5. Turn ignition on. Using adapter cables from Test Kit (VAG 1594), connect jumper wire to terminals No. 4 and 18 of test box. Using DVOM, measure voltage supply at test box sockets No. 1 and 4, (+15 and ground). Measure voltage supply at test box sockets No. 2 and 4, (+15 and ground). Measure voltage supply at test box sockets No. 1 and 5, (+15 and ground). Measure voltage supply at test box sockets No. 2 and 5, (+15 and ground). Battery voltage should be present. If battery voltage is present, ECM ground and voltage supply are okay. Test is complete. If ECM ground and voltage supplies are not okay, go to next step.
6. Check terminal 30 (B+) at voltage supply relay, see ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and **Fig. 12** . If wiring to voltage supply relay is not okay, repair wiring. If voltage supply relay is still not functional, check each individual wire going to voltage relay for open circuit and short circuit and check voltage supply relay, repair or replace as necessary.
7. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If voltage supply is still not okay and all voltage supply wiring and voltage supply relay is okay, go to next step.
8. Replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

ECM (248) REMOVAL & INSTALLATION

CAUTION: When replacing ECM (J248). It is necessary to adapt ECM to immobilizer. No information is available for VW.

CAUTION: Manufacturers states that scan tools VAS 5051 and VAS 5052 MUST be programmed with correct Importer/Dealer number as well as correct time when adapt ECM to immobilizer from model year 2002 on (Generation III immobilizer).

1. Before disconnecting Engine Control Module (ECM) record code and identification number from ECM that is to be replaced. See **ENGINE CONTROL MODULE (J248) CODING** . For Beetle go to next step. For Golf and Jetta, go to step 3 .
2. Turn ignition off. Remove cowl panel. Release lock tab for ECM harness connector and disconnect harness connectors.
3. Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for ECM harness connector and disconnect harness connectors. Installation is in reverse order.

4. After installing ECM perform following procedures:
    - Code ECM, see **ENGINE CONTROL MODULE (J248) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** .
    - Adapt ECM to Ignition key immobilize.
    - Generate ECM readiness code. See **READINESS CODE** .

ENGINE CONTROL MODULE (J248) CODING

NOTE: Before disconnecting Engine Control Module (ECM) record code and identification number from ECM that is to be replaced.

NOTE: After coding ECM and starting engine for first time, allow engine to idle for several minutes so ECM can go through its learn function. Idle speed may be erratic while ECM is learning.

If ECM is replaced or incorrect ECM coding is displayed on scan tool, ECM needs to be coded. If new ECM is not properly coded, the following problems may occur:

- Driveability problems (e.g., harsh shifting).
- False malfunctions stored in ECM memory.
- Increased fuel consumption.
- Increased exhaust emissions.
- Reduction in transmission life.
- All ECM functions are not carried out (e.g. EVAP system operation).
- On front wheel drive vehicles with anti-slip regulation (ASR), ASR warning lamp comes on.

Generic Scan Tool

Turn ignition on, engine off. Follow scan tool manufacturer's instructions to code Engine Control Module (ECM). For coding options, see **ECM CODING OPTIONS** table.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Connect scan tool to DLC. See **Fig. 1** . Press "1" key, selecting Rapid data transfer. Press keys "0" and "1" for "Engine electronics" and enter by pressing "Q" key. Print or record code coding information from Engine Control Module (ECM - J248) that is to be replaced.
2. Leave scan tool in mode "0" and "1" for address word "Engine Electronics", press keys "0" and "7" for function "Code Control Module" and enter by pressing "Q" key. Enter appropriate code number for this vehicle. See **ECM CODING OPTIONS** table. Enter by pressing Q key.
3. ECM identification and coding should display on scan tool. Verify that correct code number has been entered. Press right arrow key. Press keys "0" and "6" for function "End Output" and enter by pressing Q key. Turn ignition off to permanently store code number, turn ignition on. If "Function is unknown or

cannot be carried out at the moment" displays, a non-authorized code number has been entered, verify code number and enter correct code number.

4. After coding ECM and starting engine for first time, allow engine to idle for several minutes so ECM can go through learn function. Idle speed may be erratic while ECM is learning. Road test vehicle. See **TEST DRIVE RELEARN PROCEDURE** . Read Readiness Code and generate Readiness Code if necessary. See **READINESS CODE** .

ECM (248) CODING OPTIONS

ECM Part Number Application & Coding	Application
ECM Part No. Application 038 906 012 FD & 038 906 012 BD Coding	
00001	4-Speed Automatic Transmission, ABS & Airbag
00002	5-Speed Manual Transmission, ABS & Airbag
00004	4-Speed Automatic Transmission & Airbag
ECM Part No. Application 038 906 012 FR & 038 906 012 BC & Coding	
00002	5-Speed Manual Transmission & Airbag
00005	5-Speed Manual Transmission
ECM Part No. Application 038 906 012 FE & 038 906 012 BR & Coding	
00001	4-Speed Automatic Transmission & ABS
00002	5-Speed Manual Transmission & ABS
00004	4-Speed Automatic Transmission

ACTIVATING/DEACTIVATING CRUISE CONTROL

Generic Scan Tool

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Follow scan tool manufacturer's instructions to Activating/Deactivating Cruise Control.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

Activating Cruise Control

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Press keys "1", "1", "4", "6" and "3" for Code Number 11463 and enter by pressing "Q" key. Turn ignition off. Activation is complete.

Deactivating Cruise Control

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, with engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Press keys "1", "6", "1", "6" and "7" for Code Number 16167 and enter by pressing "Q" key. Turn ignition off. Deactivation is complete.

DRIVE CYCLES

For Test Drive Relearn Procedure and Readiness Code, see **TEST DRIVE RELEARN PROCEDURE** and **READINESS CODE** . If emission related repairs have been performed or vehicle is to be smog checked, it is recommended that readiness code be read and readiness code be generated if necessary. See **READINESS CODE** .

Warm-Up Phase: Engine started with coolant temperature below 122°F (50°C), then switched off at above 162°F (72°C).

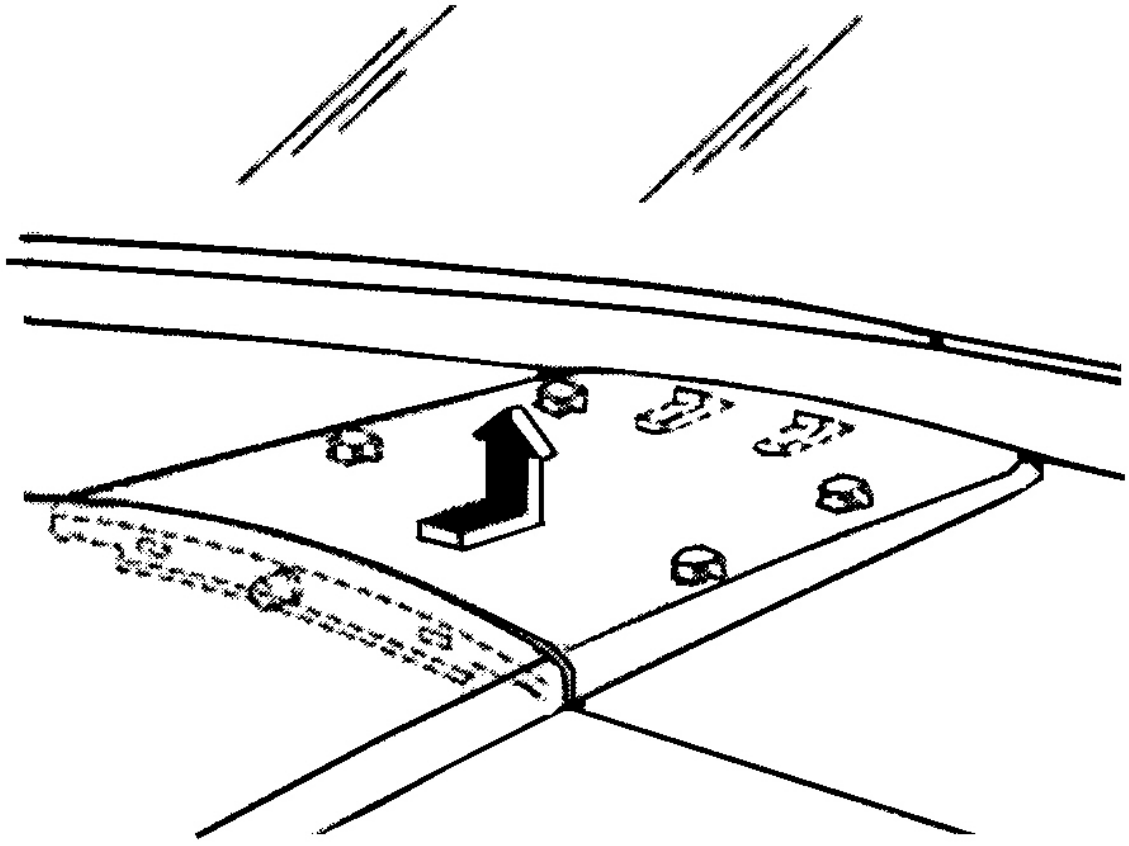
Road Test: Coolant temperature needs to be greater than 176°F (80°C). Idle, partial throttle, full throttle and overdrive must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM.

CONNECTING VAG TEST BOX

CAUTION: When battery is disconnected, radio will go into anti-theft protection mode. Obtain radio anti-theft protection code from owner prior to servicing vehicle.

BEETLE

Turn ignition off. Move center dash panel forward and up. Remove center dash panel. Remove screw for left front dash cover. See **Fig. 4** . Lift cover at right side and pull to right to remove. Connect test equipment. See **Fig. 5** .



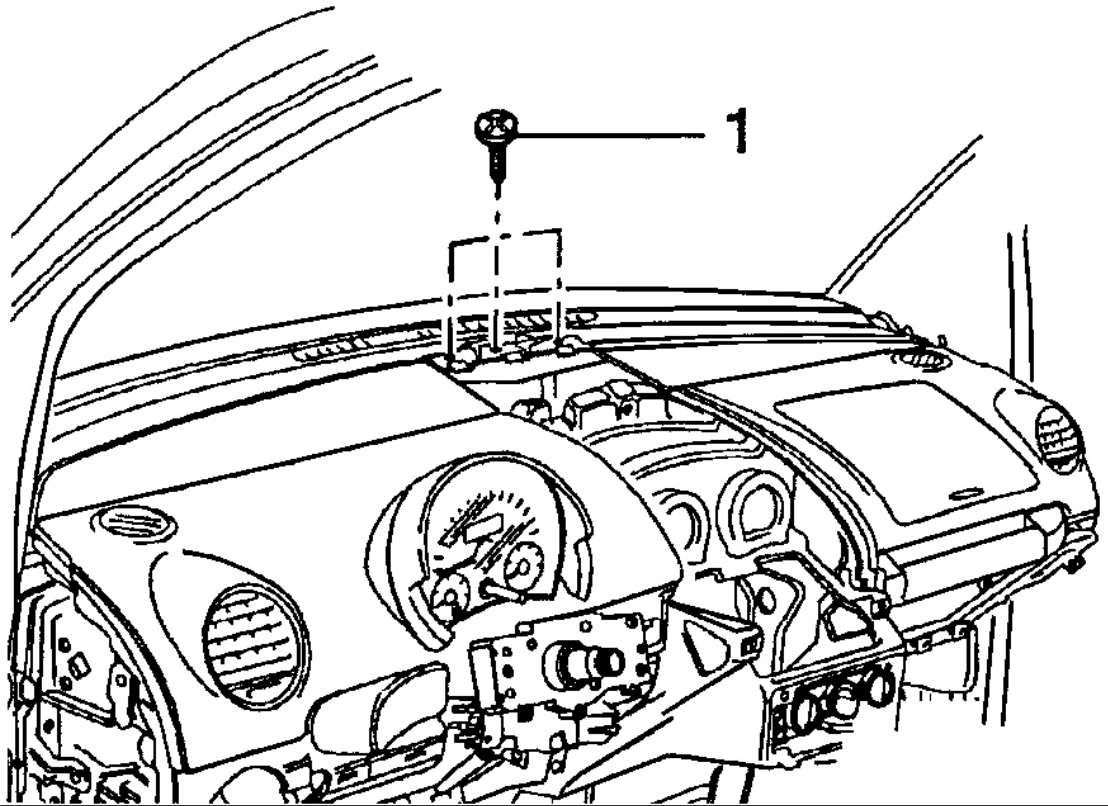
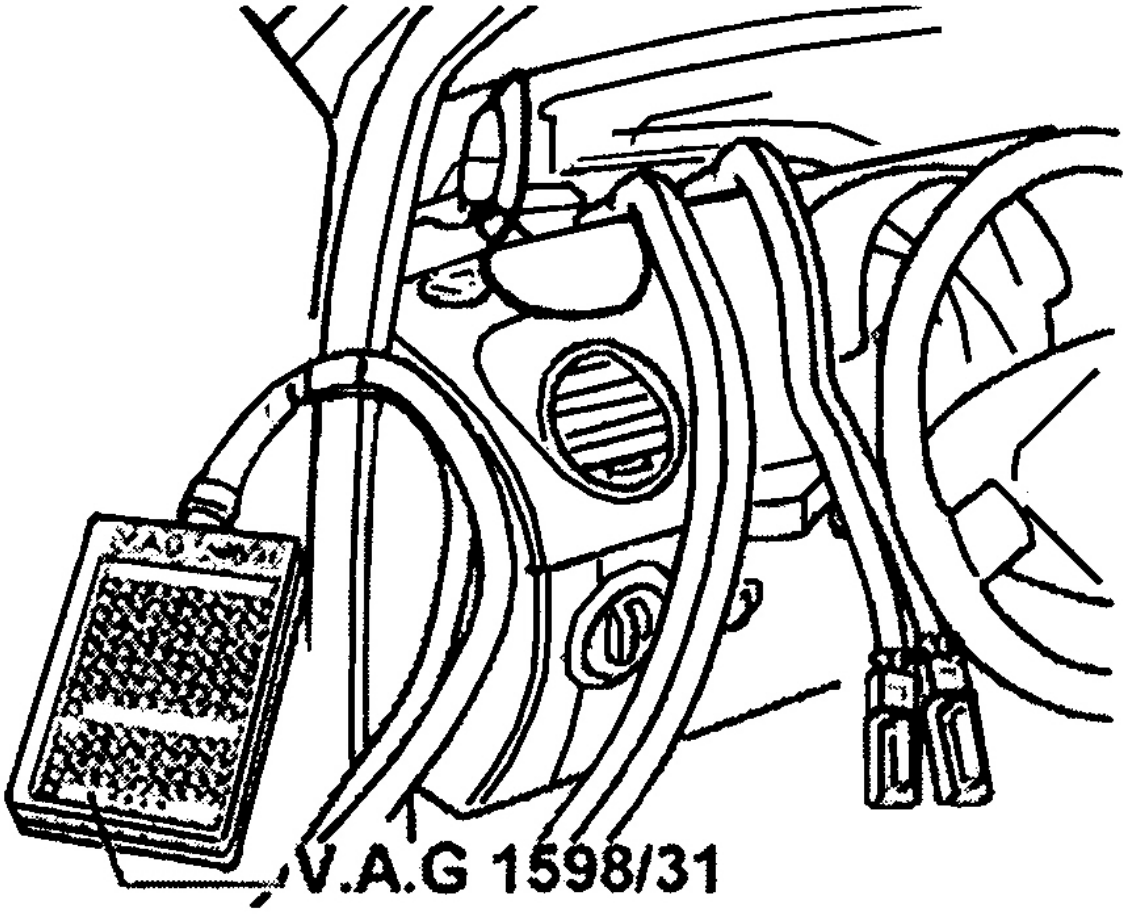

1

Fig. 4: Removing Center & Left Inner Dash Covers (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00064788

Fig. 5: Connecting VAG Test Box 1598/31 (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

GOLF & JETTA

Turn ignition off. Remove wiper arms and cowl panel. Connect test equipment. See **Fig. 6** .

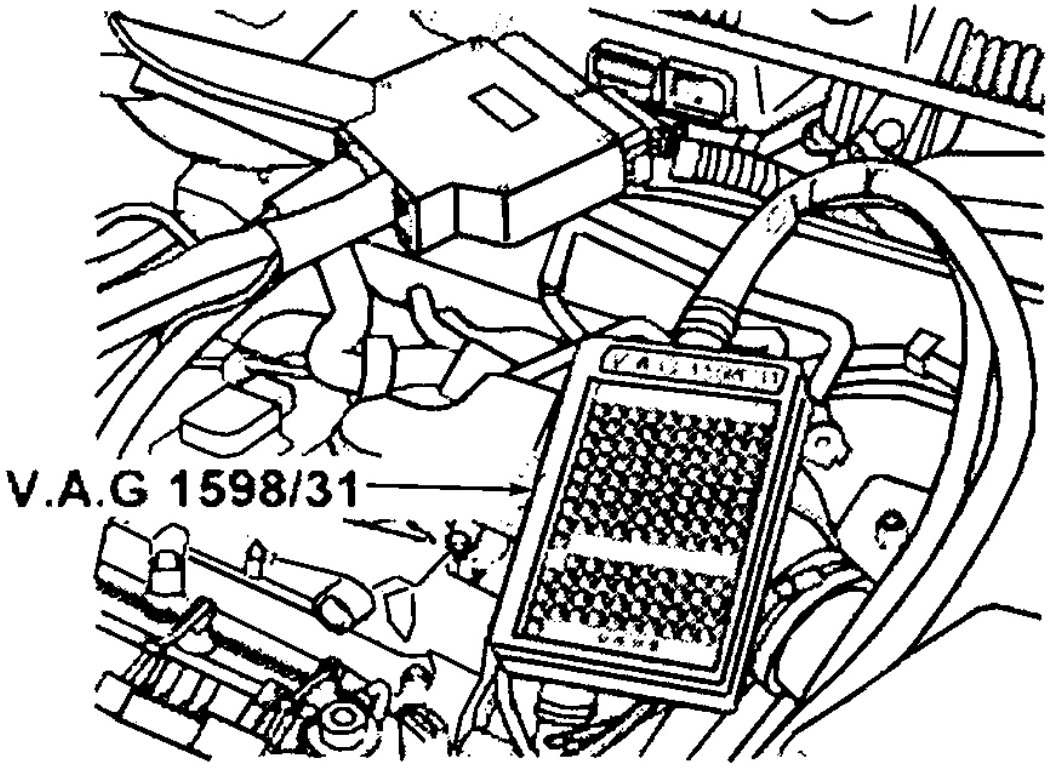


Fig. 6: Connecting VAG Test Box 1598/31 (Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DIAGNOSTIC TROUBLE CODE DEFINITIONS

DIAGNOSTIC TROUBLE CODE DEFINITIONS

SAE	VAG	Description
(1)	**00668**	Voltage Terminal 30 - Implausible Signal
(1)	**00671**	Cruise Control Switch (E45) - Undefined Switch Position
(1)	**00741**	Brake Pedal Monitoring - Implausible Signal
(1)	**01044**	ECM (J248) - Incorrectly Coded (No Display)
(1)	**01117**	Load Signal For Generator DF - Implausible Signal
(1)	**01193**	Pre-Heating Coolant/Low Heat Output Relay (J359) - Short To B+
(1)	**01194**	Pre-Heating Coolant/High Heat Output Relay (J360) - Short To B+
(1)	**01282**	Change-Over Valve For Intake Manifold Flap (N239) - Open Circuit/Short Circuit To Ground

P0101	16485	MAF Sensor Signal (G70) - Open Circuit/Short To B+
P0102	16486	MAF Sensor Signal (G70) - Open Circuit/Short To B+
P0103	16487	MAF Sensor Signal (G70) - Open Circuit/Short To Ground
P0105	16489	MAP Sensor Signal (G71) - Open Circuit/Short To Ground
P0106	16490	MAP Sensor Signal (G71) - Open Circuit/Short To Ground
P0107	16491	MAP Sensor Signal (G71) - Open Circuit/Short To Ground
P0108	16492	MAP Sensor Signal (G71) - Open Circuit/Short To Ground
P0116	16500	ECT Sensor (G62) - Implausible Signal
P0117	16501	ECT Sensor (G62) - Signal Too Low
P0118	16502	ECT Sensor (G62) - Signal Too High
P0183	16567	Fuel Temperature Sensor (G81) - Open Circuit/Short To B+
P0216	16600	Cold Start Injector (N108) - Open Circuit/Short To Ground
P0225	16609	Throttle Position Sensor (G79) - Supply Voltage Too High/Too Low Or Open Circuit
P0226	16610	Throttle Position Sensor (G79) - Implausible Signal
P0228	16612	Throttle Position Sensor (G79) - Signal Too High
P0234	16618	Boost Pressure Regulation - Control Limit Exceeded
P0245	16629	Wastegate By-Pass Regulator Valve (N75) - Open Circuit/Short To Ground
P0246	16630	Wastegate By-Pass Regulator Valve (N75) - Short To Positive
P0300	16684	Misfire Recognized
P0301	16685	Cylinder 1 - Misfire
P0302	16686	Cylinder 2 - Misfire
P0303	16687	Cylinder 3 - Misfire
P0304	16688	Cylinder 4 - Misfire
P0321	16705	Engine Speed (RPM) Sensor (G28) - Implausible Signal
P0322	16706	Engine Speed (RPM) Sensor (G28) - No Signal
P0380	16764	Glow Plug Monitoring - No Display
P0401	16785	EGR Vacuum Regulator Solenoid Valve (N18) - Gas Flow Too Low - Short To B+
P0402	16786	EGR Vacuum Regulator Solenoid Valve (N18) - Gas Flow Too High - Short To B+
P0501	16885	Vehicle Speed Sensor (VSS) - Implausible Signal
P0571	16955	Brake Light Switch - Implausible Signal
P0601	16985	ECM (J248) - Inoperative
P0605	16989	ECM (J248) - Inoperative
P0606	16990	ECM (J248) - Inoperative
P0670	17054	Glow Plug Control Module (J370) - Open Circuit/Short To Ground
P0671	17055	Glow Plug Cylinder No. 1 - Open Circuit/Short To Ground

P0672	17056	Glow Plug Cylinder No. 2 - Open Circuit/Short To Ground
P0673	17057	Glow Plug Cylinder No. 3 - Open Circuit/Short To Ground
P0674	17058	Glow Plug Cylinder No. 4 - Open Circuit/Short To Ground
P0684	17068	Glow Plug Control Module (J370) - Open Circuit To ECM
P1144	17552	MAF Sensor Signal (G70) - Open Circuit/Short To Ground
P1145	17553	MAF Sensor Signal (G70) - Short To B+
P1146	17554	MAF Sensor Signal (G70) - Supply Voltage Too High/Low
P1155	17563	MAP Sensor Signal (G71) - Short To B+
P1156	17564	MAP Sensor Signal (G71) - Open Circuit/Short To Ground
P1157	17565	MAP Sensor (G71) - Supply Voltage Too High/Low
P1158	17566	MAP Sensor (G71) - Implausible Signal
P1160	17568	IAT Sensor (G72) - Short To Ground
P1161	17569	IAT Sensor (G72) - Open Circuit/Short To B+
P1162	17570	Fuel Temperature Sensor (G81) - Short To Ground
P1163	17571	Fuel Temperature Sensor (G81) - Open Circuit/Short To B+
P1164	17572	Fuel Temperature Sensor (G81) - Implausible Signal
P1245	17653	Needle Lift Sensor (G80) - Short To Ground
P1246	17654	Needle Lift Sensor (G80) - Implausible Signal
P1247	17655	Needle Lift Sensor (G80) - Open Circuit/Short To B+
P1248	17656	Cold Start Injector (N108) - Control Difference
P1251	17659	Cold Start Injector (N108) - Short To B+
P1252	17660	Cold Start Injector (N108) - Open Circuit/Short To Ground
P1255	17663	ECT Sensor (G62) - Short To Ground
P1256	17664	ECT Sensor (G62) - Open Circuit/Short To B+
P1296	17704	Malfunction In Cooling System
P1354	17762	Modulating Piston Displacement Sensor (G149) - Electrical Malfunction In Circuit
P1387	17795	ECM (J248) - Inoperative
P1402	17810	EGR Vacuum Regulator Solenoid Valve (N18) - Short To B+
P1403	17811	EGR System - Control Difference
P1441	17849	EGR Vacuum Regulator Solenoid Valve (N18) - Open Circuit/Short To Ground
P1503	17911	Load Signal For Generator DF - Implausible Signal
P1537	17945	Fuel Cut-Off Valve (N109) - Incorrect Function
P1538	17946	Fuel Cut-Off Valve (N109) - Open Circuit/Short to Ground
P1540	17948	Vehicle Speed Signal (VSS) - Signal To High
P1546	17954	Wastegate By-Pass Regulator Valve (N75) - Short To Positive
P1549	17957	Wastegate By-Pass Regulator Valve (N75) - Open Circuit/Short To Ground

P1550	17958	Charge Pressure - Control Difference
P1556	17964	Boost Pressure Regulation - Limit Not Reached
P1557	17965	Boost Pressure Regulation - Control Limit Exceeded
P1561	17969	Injection Pump Quality Adjuster (N146) - Control Difference
P1562	17970	Injection Pump Quality Adjuster (N146) - Upper Stop Value
P1563	17971	Injection Pump Quality Adjuster (N146) - Lower Stop Value
P1569	17977	Cruise Control Switch (E45) - Implausible Signal
P1570	17978	ECM (J248) - Blocked
P1600	18008	ECM Voltage Supply Terminal 15 - Voltage To Low
P1601	18009	Power Supply Relay Terminal 30 (B+) - Relay Sticking (Intermittent)
P1609	18017	Crash Switch - Airbag
P1612	18020	ECM (J248) - Incorrectly Coded
P1616	18024	Glow Plug Indicator Lamp (K29) - Short To B+
P1617	18025	Glow Plug Indicator Lamp (K29) - Open Circuit/Short To Ground
P1618	18026	Glow Plug Relay (J52) - Short To B+
P1619	18027	Glow Plug Relay (J52) - Open Circuit/Short To Ground
P1626	18034	Drive Train CAN-Bus - Implausible Signal From Transmission Control Module (J217)
P1631	18039	Throttle Position Sensor (G79) - Signal Too High
P1632	18040	Throttle Position Sensor (G79) - Supply Voltage Too High/Too Low Or Open Circuit
P1636	18044	Drive Train CAN-Bus - No Signal From Airbag Control Module (J234)
P1639	18047	Throttle Position Sensor (G79) - Implausible Signal
P1640	18048	ECM (J248) - Inoperative
P1648	18056	Drive Train CAN-Bus - System Component Inoperative
P1649	18057	Drive Train CAN-Bus - Implausible Signal From ABS Control Module (J104)
P1650	18058	Drive Train CAN-Bus - No Message From Instrument Cluster
P1642	18050	Drive Train CAN-Bus - Malfunction In Airbag System
P1653	18061	Drive Train CAN-Bus - Malfunction In ABS System
P1654	18062	Drive Train CAN-Bus - Malfunction In Combi-Instrument Cluster - Oil Level/Temperature Sender Defective
P1657	18065	Air Conditioner Input/Output - Short To B +
P1682	18090	Drive Train CAN-Bus - Implausible Signal From ABS Control Module (J104)
P1851	18259	Drive Train CAN-Bus - Implausible Signal From ABS Control Module (J104)
P1854	18262	Drive Train CAN-Bus - Inoperative
P3000	19456	Drive Train CAN-Bus - No Signal From CAN Bus Interface (J533) - Glow Plug Warning Lamp (K29)

P3002	19458	Kick Down Switch (F8) - Implausible Signal
P3003	19459	Pre-Heating Coolant/Low Heat Output Relay (J359) - Short To B+
P3005	19461	Pre-Heating Coolant/High Heat Output Relay (J360) - Short To B+
P3104	19560	Change-Over Valve For Intake Manifold Flap (N239) - Short To B+
P3105	19561	Change-Over Valve For Intake Manifold Flap (N239) - Open Circuit/Short Circuit To Ground
(1) No equivalent P code for this VW code.		

COMPONENT LOCATIONS

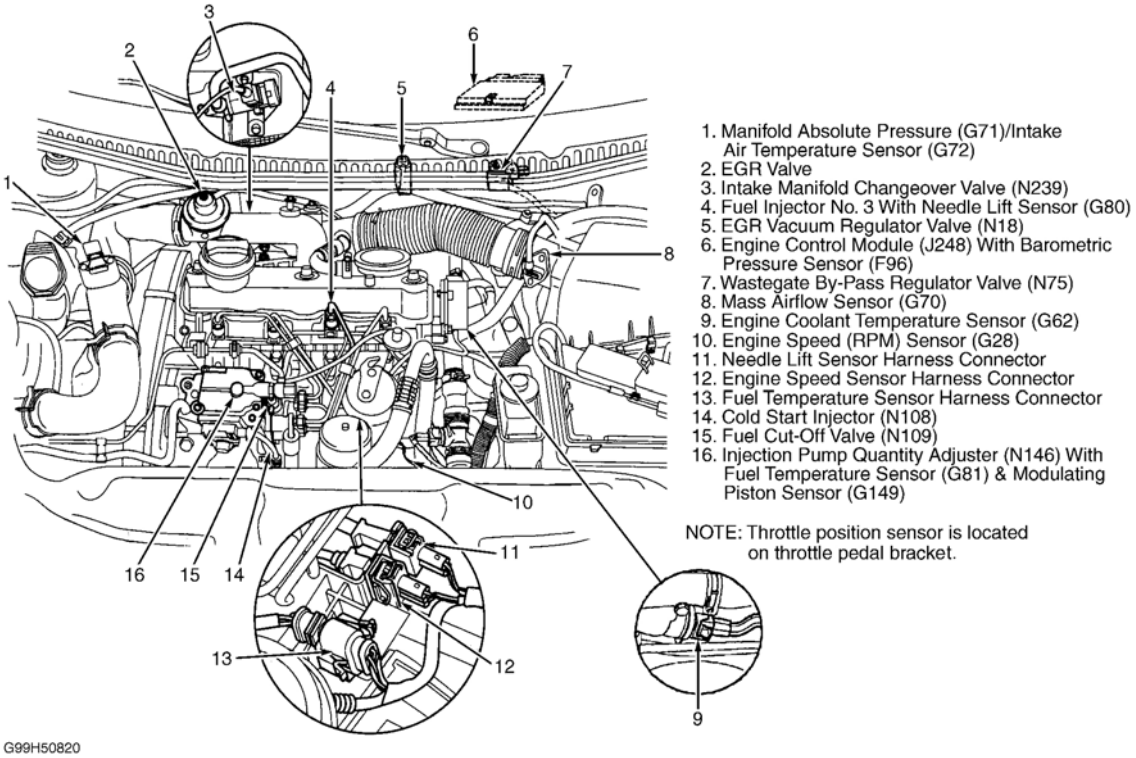
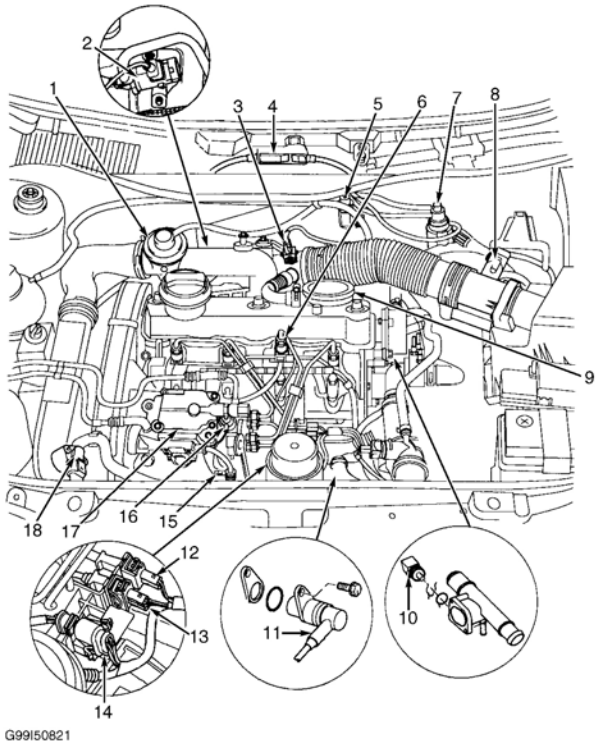

1. Manifold Absolute Pressure (G71)/Intake Air Temperature Sensor (G72)
2. EGR Valve
3. Intake Manifold Changeover Valve (N239)
4. Fuel Injector No. 3 With Needle Lift Sensor (G80)
5. EGR Vacuum Regulator Valve (N18)
6. Engine Control Module (J248) With Barometric Pressure Sensor (F96)
7. Wastegate By-Pass Regulator Valve (N75)
8. Mass Airflow Sensor (G70)
9. Engine Coolant Temperature Sensor (G62)
10. Engine Speed (RPM) Sensor (G28)
11. Needle Lift Sensor Harness Connector
12. Engine Speed Sensor Harness Connector
13. Fuel Temperature Sensor Harness Connector
14. Cold Start Injector (N108)
15. Fuel Cut-Off Valve (N109)
16. Injection Pump Quantity Adjuster (N146) With Fuel Temperature Sensor (G81) & Modulating Piston Sensor (G149)
NOTE: Throttle position sensor is located on throttle pedal bracket.
G99H50820

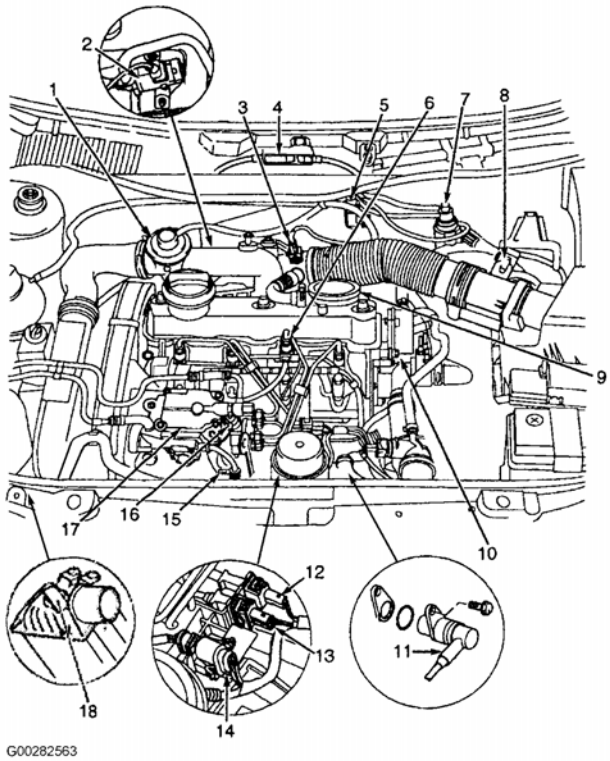
Fig. 7: Locating Engine Control System Components (Early Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. EGR Valve
2. Intake Manifold Changeover Valve (N239)
3. Positive Crankcase Ventilation Heating Element (N79)
4. Engine Control Module (J248) With Barometric Pressure Sensor (F96)
5. EGR Vacuum Regulator Valve (N18)
6. Fuel Injector No. 3 With Needle Lift Sensor (G80)
7. Wastegate By-Pass Regulator Valve (N75)
8. Mass Airflow Sensor (G70)
9. PCV Valve
10. Engine Coolant Temperature Sensor (G62)
11. Engine Speed (RPM) Sensor (G28)
12. Brown Needle Lift Sensor Harness Connector
13. Engine Speed Sensor Harness Connector
14. Black 10-Pin Harness Connector, For Fuel Temperature Sensor (G81), Cold Start Injector (N108), Fuel Cut Off Valve (N109), Fuel Quantity Adjuster (N146) and Modulating Piston Displacement Sensor (G149)
15. Cold Start injector (N108)
16. Fuel Cut-Off Valve (N109)
17. Injection Pump Quantity Adjuster (N146) With Fuel Temperature Sensor (G81) & Modulating Piston Displacement Sensor (G149)- (N146), (G81) & (G149) Are Integral Parts Of Fuel Injection Pump
18. Manifold Absolute Pressure (G71)/Intake Air Temperature (G72)

NOTE:Throttle position sensor is located on throttle pedal bracket.

Fig. 8: Locating Engine Control System Components (Early Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. EGR Valve
2. Intake Manifold Changeover Valve (N239)
3. Positive Crankcase Ventilation Heating Element (N79)
4. Engine Control Module (J248) With Barometric Pressure Sensor (F96)
5. EGR Vacuum Regulator Valve (N18)
6. Fuel Injector No. 3 With Needle Lift Sensor (G80)
7. Wastegate By-Pass Regulator Valve (N75)
8. Mass Airflow Sensor (G70)
9. PCV Valve
10. Engine Coolant Temperature Sensor (G62)
11. Engine Speed (RPM) Sensor (G28)
12. Brown Needle Lift Sensor Harness Connector
13. Engine Speed Sensor Harness Connector
14. Black 10-Pin Harness Connector, For Fuel Temperature Sensor (G81), Cold Start Injector (N108), Fuel Cut Off Valve (N109), Fuel Quantity Adjuster (N146) and Modulating Piston Displacement Sensor (G149)
15. Cold Start injector (N108)
16. Fuel Cut-Off Valve (N109)
17. Injection Pump Quantity Adjuster (N146) With Fuel Temperature Sensor (G81) & Modulating Piston Displacement Sensor (G149)- (N146), (G81) & (G149) Are Integral Parts Of Fuel Injection Pump
18. Manifold Absolute Pressure (G71)/Intake Air Temperature (G72)

NOTE:Throttle position sensor is located on throttle pedal bracket.

Fig. 9: Locating Engine Control System Components (Late All Models)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

CAUTION: There are two types of bolts for injection pump sprocket. See Fig. 10 .

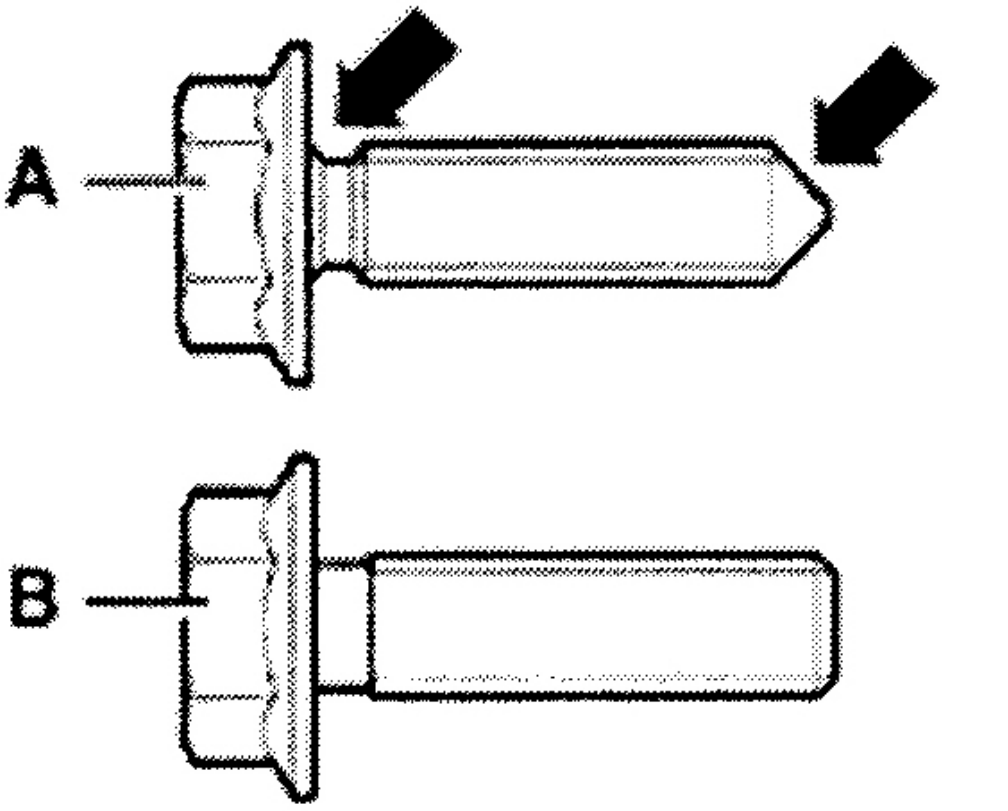
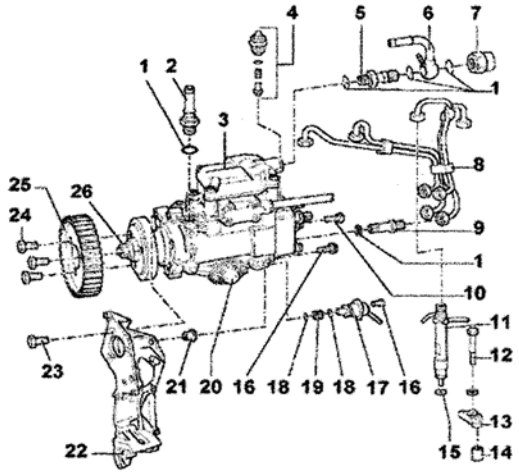


Fig. 10: Identifying Injection Pump Sprocket Bolts
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: **Fuel Temperature Sensor (G81), Injection Pump Quantity Adjuster (N146) and Modulating Piston Displacement Sensor (G149) are integral parts of fuel injection pump and can not be replaced separately.**



♦ *Components marked with a double asterisk (**) can be checked with the output DTM.*

1 - Oil seal

♦ Always replace

2 - Union, 25 Nm (18 ft lb)

♦ For supply line

♦ From fuel filter

3 - Injection pump

♦ With quantity adjuster (metering)

♦ With Fuel Temperature Sensor (G81)

♦ With Quantity Adjuster (N146)

♦ With Modulating Piston Displacement Sensor (G149)

4 - Fuel shut-off valve (N109) 18 ft lb (25 Nm)

5 - Union

♦ For return line

6 - Return line

♦ To control valve/fuel filter

7 - 18 ft lb (25 Nm)

8 - Injector lines

♦ Tighten to 18 ft lb (25 Nm)

♦ Always remove two-part linework complete

♦ Do not alter shape

9 - Line union, 33 ft lb (45 Nm)

♦ With pressure valve

10 - 18 ft lb (25 Nm)

11 - Injector

♦ For No. 3 cylinder with Needle Lift Sensor (G80)

12 - 15 ft lb (20 Nm)

13 - Retainer

14 - Mounting

15 - Copper washer

♦ Always replace

16 - 7 ft lb (10 Nm)

17 - Cold Start Injector (N108)

18 - Gasket

♦ Always replace

19 - Strainer

♦ Clean strainer if soiled

20 - Timing control cover

♦ If leaking, replace gasket

21 - Sleeve

♦ With nut

22 - Compact bracket

♦ For injection pump, Generator and power steering pump

23 - 18 ft lb (25 Nm)

24 - 15 ft lb (20 Nm) + $^{1}/_{4}$ turn (90°) further

♦ Always replace

♦ The turning angle can be checked with a commercial protractor

25 - Injection pump sprocket

26 - Nut

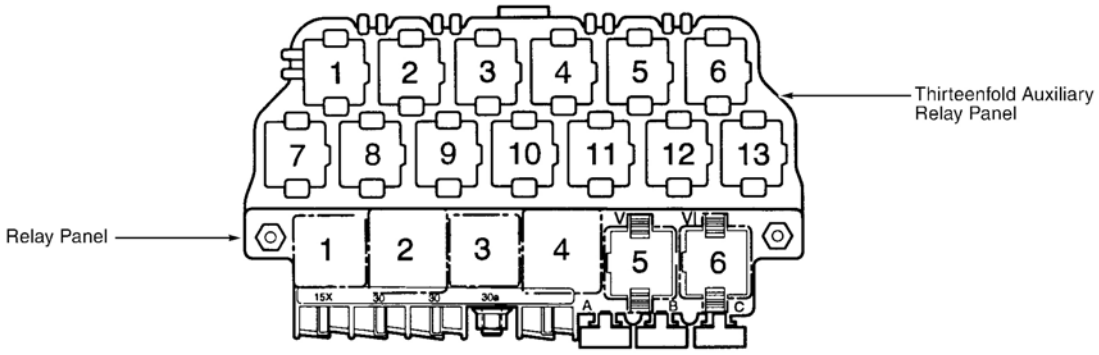
♦ For hub

♦ Do not loosen or the injection pump basic setting may be altered. This cannot be reset with normal workshop equipment

G00282562

Fig. 11: Identifying Fuel Injection Pump Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Relay panel is located under driver's side of dash, behind trim panel. Fuel pump relay is not used until model year 2004 with engine code BEW. Control number for Load Reduction Relay is (Control Number 100), for Glow Plug Relay (Control Number 180) and for Power Supply Relay (Control Number 109).



RELAY PANEL
1. Dual Horn Relay
2. Load Reduction Relay
3. Not Used
4. Fuel Pump (FP) Relay
5. Wiper Washer Intermittent Relay
6. Wiper Washer Intermittent Relay

THIRTEENFOLD AUXILIARY RELAY PANEL
1. Not Used
2. Rear Lid Motor Remote Unlock Relay
3. Starter Locking Relay (Clutch Pedal Switch)
4. Foglight Relay
5. Not Used
6. Not Used
7. Daytime Running Lights Changeover Relay
8. Daytime Running Lights Changeover Relay
9. Not Used
10. Glow Plug Relay
11. Park/Neutral Position (PNP) Relay
12. Power Supply Relay
13. Not Used

Fig. 12: Identifying Relay Panel Components (1.9L Turbo Diesel)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DIAGNOSTIC TESTS

WARNING: For safety during road test, it is advisable to have a helper operate tester from rear seat. If test and measuring instruments are operated from front passenger's seat and vehicle is involved in an accident, there is a possibility the person sitting in this seat may receive serious injuries when air bag is deployed.

CAUTION: Perform all resistance and voltage tests with a Digital Volt-ohmmeter (DVOM) with minimum 10-megohm impedance, unless stated otherwise in test procedures. Ensure ignition switch is in OFF position when performing resistance tests.

- Thoroughly clean all unions and the adjacent areas before disconnecting any part of fuel supply/injection system.
- Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths.
- Carefully cover opened components or seal if the repair cannot be carried out immediately.

- When fuel supply/injection system is open, do not work with compressed air if it can be avoided. Do not move the vehicle unless absolutely necessary.
- Only install clean components.
- Make sure that no diesel fuel contacts the coolant hoses. Clean or replace affected hoses immediately.

NOTE: Read and record DTCs before starting diagnostic work, (some testing procedures will set DTCs).

NOTE: Before replacing any component, verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure all wiring is okay and connectors at component and ECM are clean and tight. When codes have been cleared or voltage supply to ECM has been interrupted, ECM loses all "learned" and "basic" values. Serious driveability problems may occur depending on vehicle mileage. After reconnecting ECM, it is necessary to perform relearn procedure. See TEST DRIVE RELEARN PROCEDURE .

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be loose contact or a brief open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTC(s) will be erased from ECM memory. A warm-up phase is engine started with coolant temperature below 122°F (50°C), and switched off at above 162°F (72°C).

NOTE: To properly diagnose vehicle, vehicle manufacturer recommends use of Scan Tool (VAG 1551/1552 or VAS 5051/5052) and Test Box (VAG 1598). Test box terminal numbers and ECM terminal numbers are identical. To identify connector terminal wire colors, see ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

DTC P0101/16485, DTC P0102/16486, DTC P0103/16487, DTC P1144/17552, DTC P1145/17553 & DTC P1146/17554

Code Definition

DTC P0101/16485
MAF Sensor Signal (G70) - Open Circuit/Short To B +

DTC P0102/16486
MAF Sensor Signal (G70) - Open Circuit/Short To B +

DTC P0103/16487
MAF Sensor Signal (G70) - Open Circuit/Short To Ground

DTC P1144/17552
MAF Sensor Signal (G70) - Open Circuit/Short To Ground

DTC P1145/17553
MAF Sensor Signal (G70) - Short To B+

DTC P1146/17554
MAF Sensor Signal (G70) - Supply Voltage Too High/Low

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are black smoke and/or lack of power.

Test Procedures

1. Check air induction system for leaks. If problem exists, repair as necessary. If problem does not exist, go to next step.
2. Check EGR system for damaged components, disconnected connectors and leaks. If problem exists, repair as necessary. If problem does not exist, go to next step.
3. Turn ignition off. Disconnect MAF sensor harness connector. Turn ignition on. Measure voltage between ground and terminal No. 2 at MAF sensor harness connector. See **Fig. 13** . Voltage should be at least 11.5 volts. Measure voltage between terminals No. 2 and 3 at MAF sensor harness connector. Voltage should be at least 11.5 volts. Measure voltage between ground and terminal No. 4 at MAF sensor harness connector. Voltage should be approximately 5 volts. Measure voltage between terminals No. 3 and 4 at MAF sensor harness connector. Voltage should be approximately 5 volts. If voltages are as specified, replace MAF sensor. If any voltage is not as specified, go to next step.
4. Turn ignition off. Disconnect Engine Control Module (ECM) harness connector. Connect VAG 1598/31 test box to ECM harness connector, leave ECM disconnected, see **CONNECTING VAG TEST BOX** .
5.

NOTE: Test box socket numbers correspond to ECM pin numbers.

Measure resistance between terminal No. 2 at MAF sensor harness connector and socket No. 1 at test box. Measure resistance between terminal No. 2 at MAF sensor harness connector and socket No. 2 at test box. Measure resistance between terminal No. 3 at MAF sensor harness connector and socket No. 49 at test box. Measure resistance between terminal No. 4 at MAF sensor harness connector and socket No. 30 at test box. Measure resistance between terminal No. 5 at MAF sensor harness connector and socket No. 68 at test box. Resistance should be a maximum of 1.5 ohms for each reading. If resistance measurements are okay, go to next step. If any resistance measurement is not okay, repair circuit(s) as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Measure resistance between terminals No. 2, 3, 4 and 5 at MAF sensor harness connector. All resistances should be infinite between each circuit. If resistances are as specified, go to next step. If any resistance is not as specified, repair shorted circuits between MAF sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Measure resistance between ground and terminals No. 2, 3, 4 and 5 at MAF sensor harness connector. All resistances should be infinite. If resistances are as specified, go to next step. If any resistance is not as specified, repair shorted circuits between MAF sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Measure resistance between positive battery terminal and terminals No. 3, 4 and 5 at MAF sensor harness connector. All resistances should be infinite. If resistances are as specified, replace ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. If any resistance is not as specified, repair short to voltage in wiring between MAF sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

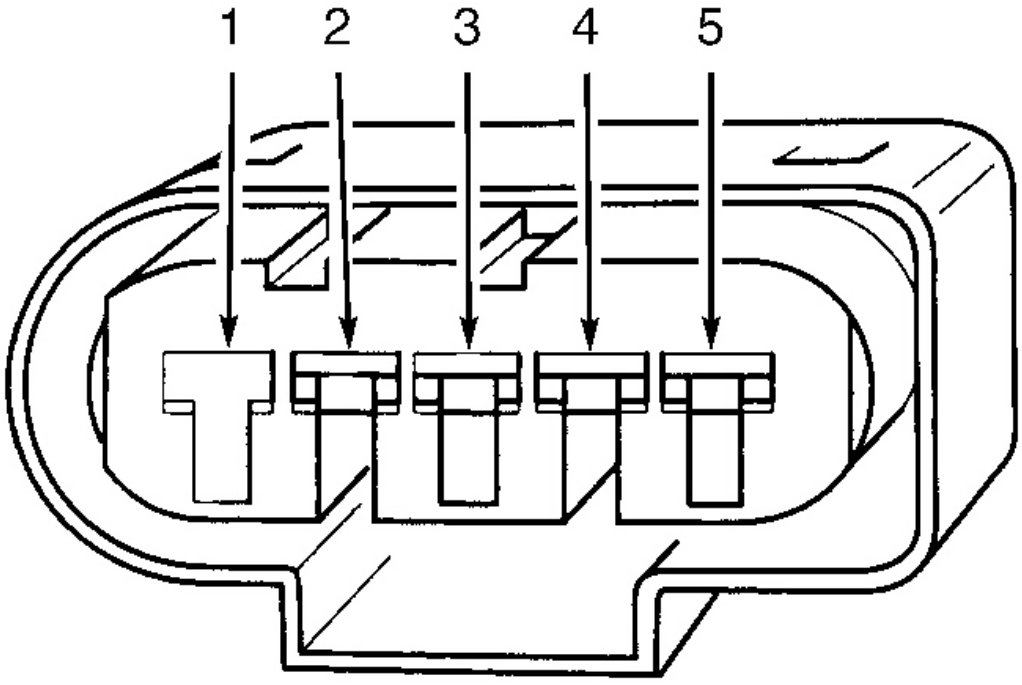


Fig. 13: Identifying MAF Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0105/16489, DTC P0106/16490, DTC P0107/16491, DTC P0108/16492, DTC P1155/17563, DTC P1156/17564, DTC P1157/17565 & DTC P1158/17566

Code Definition

DTC P0105/16489
MAP Sensor Signal (G71) - Open Circuit/Short To Ground

DTC P0106/16490
MAP Sensor Signal (G71) - Open Circuit/Short To Ground

DTC P010716491
MAP Sensor Signal (G71) - Open Circuit/Short To Ground

DTC P0108/16492
MAP Sensor Signal (G71) - Open Circuit/Short To Ground

DTC P1155/17563
MAP Sensor Signal (G71) - Short To B+

DTC P1156/17564
MAP Sensor Signal (G71) - Open Circuit/Short To Ground

DTC P1157/17565
MAP Sensor Signal (G71) - Supply Voltage

DTC P1158/17566
MAP Sensor Signal (G71) - Implausible Signal

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see Fig. 14 .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are lack of power and/or increased emissions.

Test Procedures

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

1. Connect turbocharger test unit VAG 1397A by connecting into a manifold vacuum line. Let engine idle. Connect scan tool. See **Fig. 1** . Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "8" for "Read measuring value block" and enter by pressing "Q" key. Press keys "0", "1" and "0" for display group "10" and enter by pressing "Q" key.
2.

CAUTION: Turbocharger test unit must be set to measuring range " I" (absolute pressure). Turbocharger test unit is used to provide an independent figure for comparison. If display in field 2 (BARO Sensor -F96) and display in field 3 (MAP Sensor -G71) are within 30 mbar of each other, check turbocharger test unit for miss calibration /faults and leaks.

NOTE: Barometric sensor (F96) is an integral part of ECM.

Read measured value block "10" on scan too. For examplel, display field 1 (0 mg/H), display field 2 (1027 mbar), display field 3 (1013 mbar) and display field 4 (0.0 %). Compare display in field 2 (BARO Sensor -F96) and display on turbocharger test unit VAG 1397/A. Compare display in field 3 (MAP Sensor G71) and display on turbocharger test unit VAG 1397/A. All 3 pressure readings should be the same (+ or -) 0.45 psi (30 mbar). If display field 3 is outside of specification, go to next step. If display field 2 is outside of turbocharger test unit reading by more than 0.45 psi (30 mbar), replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

3. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Turn ignition off. Disconnect MAP sensor harness connector. Disconnect ECM harness connector, Connect VAG 1598/31 test box to ECM harness connector, see **CONNECTING VAG TEST BOX** (leave ECM disconnected). Measure resistance between terminal No. 3 at MAP sensor harness connector and socket No. 31 at test box. See **Fig. 14** and **Fig. 15** . Measure resistance between terminal No. 4 at MAP sensor harness connector and socket No. 71 at test box. Both resistances should be less than 1.5 ohms. If resistances are as specified, go to next step. If any resistance is not as specified, repair open in wiring between MAP sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Measure resistance (check for short circuits) between terminals No. 3 and 4 at MAP sensor harness connector. See **Fig. 15** . Resistance should be infinite. If resistance is as specified, go to next step. If resistance is not as specified, repair short circuits between MAP sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Measure resistance between ground and terminals No. 3 and 4 at MAP sensor harness connector. Both resistances should be infinite. If resistances are as specified, go to next step. If any resistance is not as specified, repair short to ground in wiring between MAP sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Measure resistance between positive battery terminal and terminals No. 3 and 4 at MAP sensor harness connector. Both resistances should be infinite. If resistances are as specified, replace ECM. If any resistance is not as specified, repair short to voltage in wiring between MAP sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. If all wiring is okay, replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

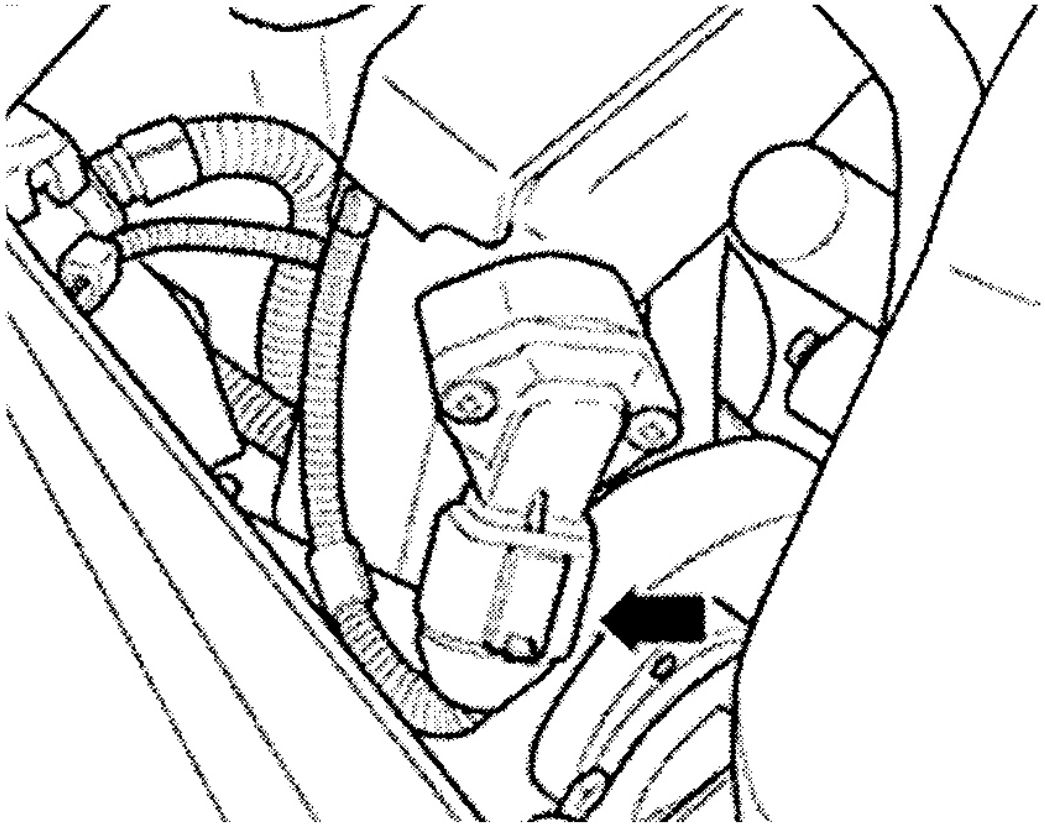


Fig. 14: Locating MAP Sensor - IAT Sensor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

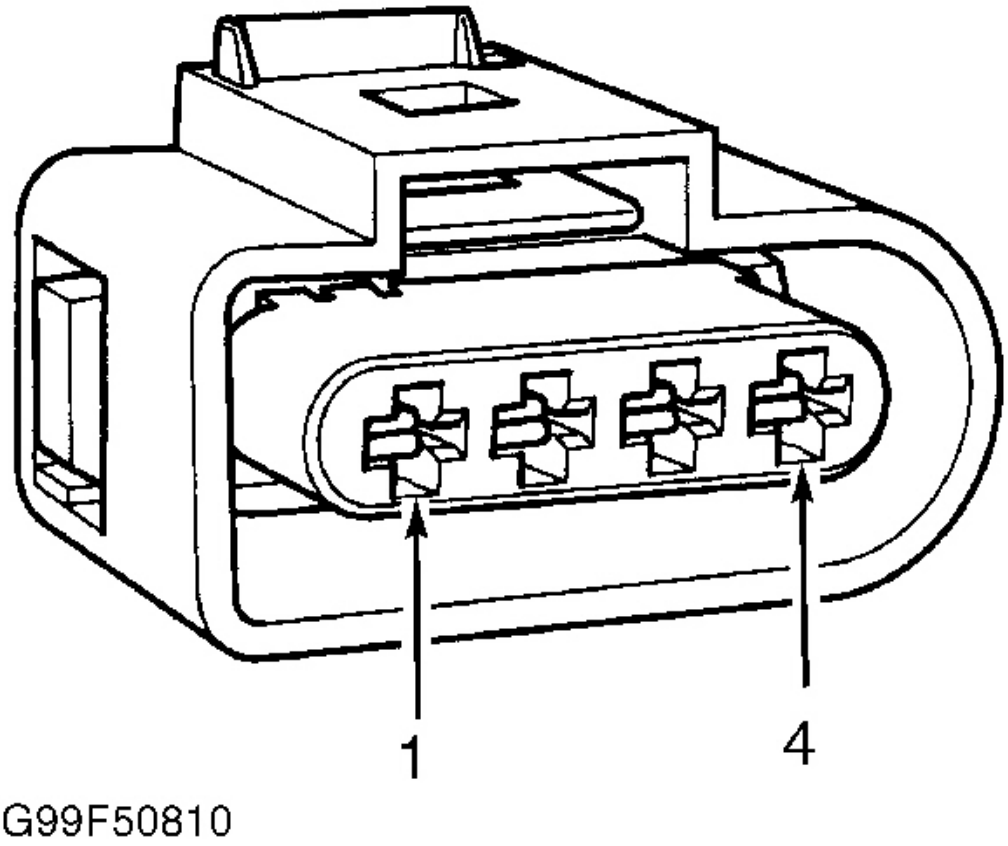


Fig. 15: Identifying MAP Sensor - IAT Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0116/16500, DTC P0117/16501, DTC P0118/16502, DTC P1255/17663, DTC P1256/17664 & DTC P1296/17704

Code Definition

DTC P0116/16500
ECT Sensor (G62) - Implausible Signal

DTC P0117/16501
ECT Sensor (G62) - Signal Too Low

DTC P0118/16502
ECT Sensor (G62) - Signal Too High

DTC P1255/17663
ECT Sensor (G62) - Short To Ground

DTC P1256/17664
ECT Sensor (G62) - Open Circuit/Short To B+

DTC P1296/17704
Malfunction In Cooling System

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are black smoke during start, glow plugs not functioning and/or glow plugs always take 15-20 seconds.

Test Procedures

1. Turn ignition off. Disconnect ECT sensor harness connector.
2. Measure resistance between terminals No. 3 and 4 at ECT sensor (component side), see, **Fig. 16** . Resistance should be 1500-2000 ohms at 86°F (30°C) and 275-375 ohms at 176°F (80°C). See **Fig. 17** . If resistance is as specified, go to next step. If resistance is not as specified, replace ECT sensor. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Turn ignition off. Disconnect Engine Control Module (ECM) harness connector. Connect VAG 1598/31 test box to ECM harness connector, leaving ECM disconnected. See **CONNECTING VAG TEST BOX** . Measure resistance between terminal No. 3 at ECT sensor harness connector and socket No. 112 at test box, then measure resistance between terminal No. 4 at ECT sensor harness connector and socket No. 104 at test box. See **Fig. 18** . Resistance should be less than 1.5 ohms for each reading. If resistance is as specified, go to next step. If resistance is not as specified, repair open in wiring between ECT sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. Measure resistance between terminals No. 3 and 4 at ECT sensor harness connector. Resistance should be infinite. If resistance is as specified, go to next step. If resistance is not as specified, repair circuits shorted to each other between ECT sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Measure resistance between ground and terminals No. 3 and 4 at ECT sensor harness connector. Both resistances should be infinite. If resistances are as specified, go to next step. If any resistance is not as specified, repair short to ground in wiring between ECT sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Measure resistance between positive battery terminal and terminals No. 3 and 4 at ECT sensor harness connector. Both resistances should be infinite.
7. If resistances are as specified, replace ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance is not as specified, repair short to voltage in wiring between MAF sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

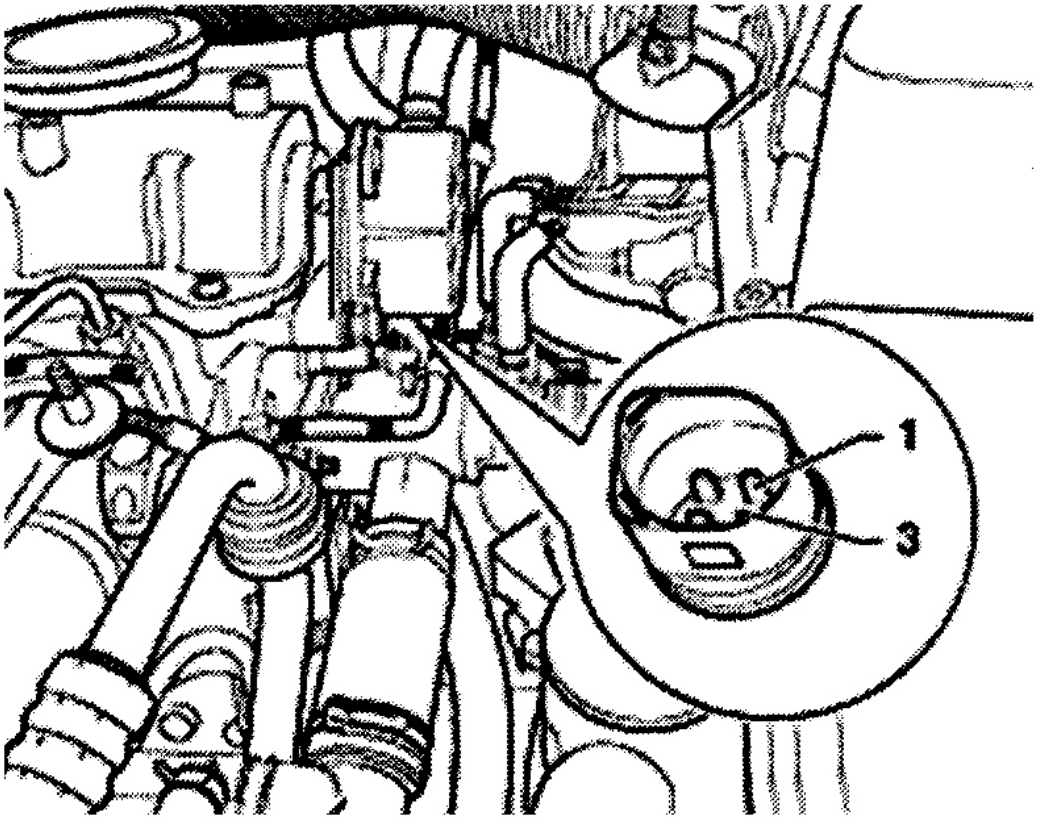


Fig. 16: Locating & Identifying ECT Sensor (G62)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

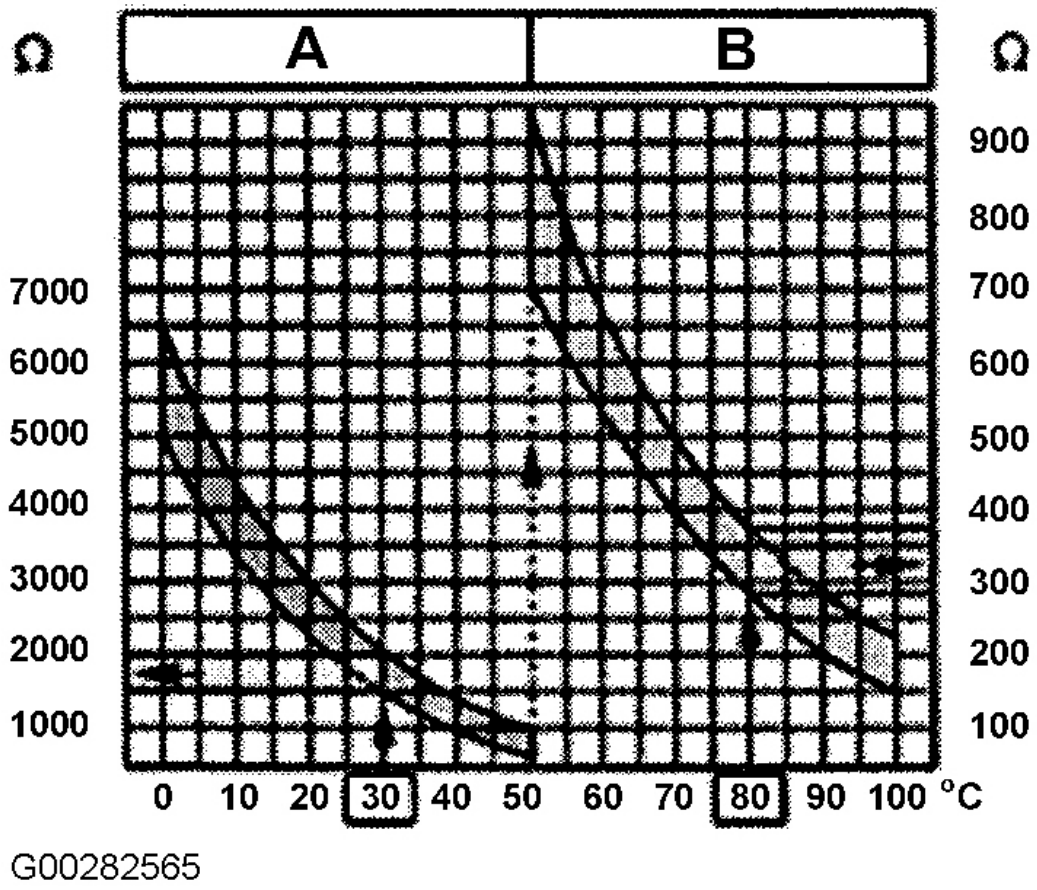
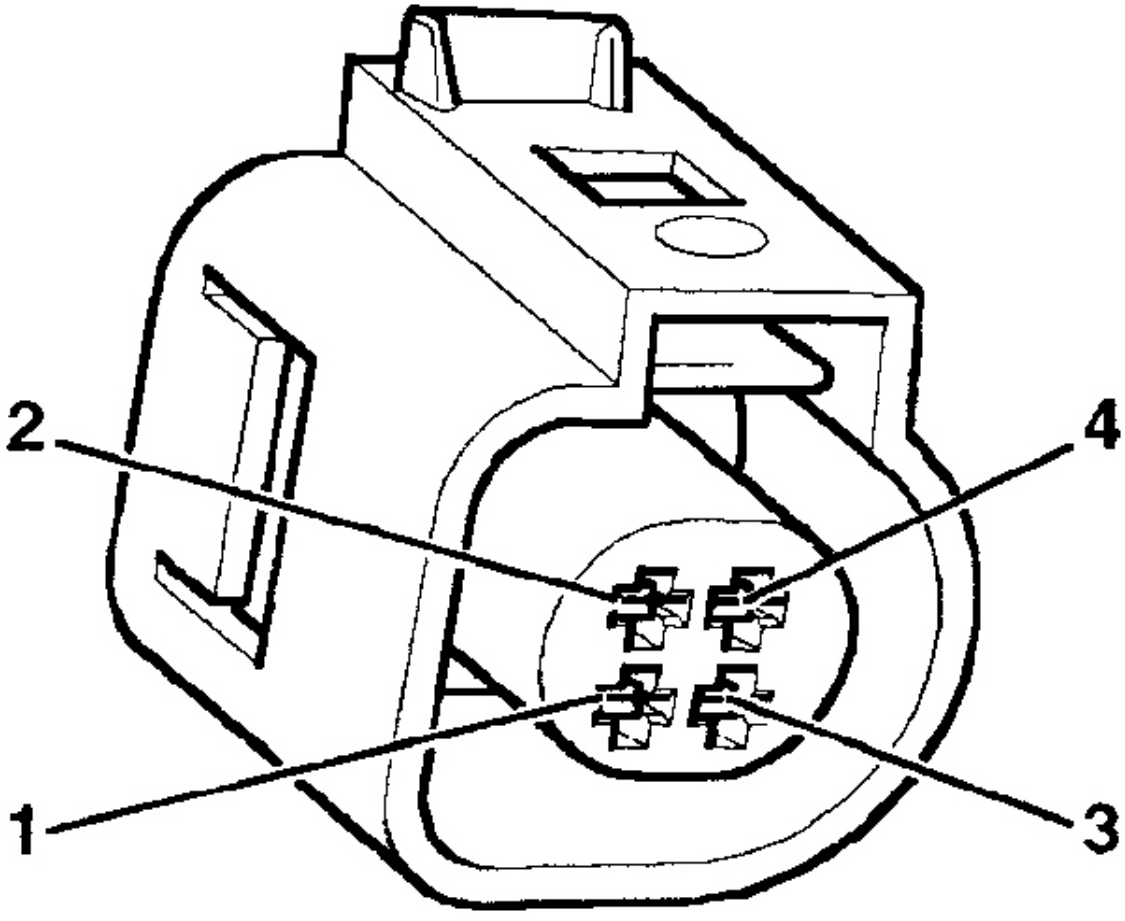


Fig. 17: Coolant & IAT Temperature Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00077164

Fig. 18: Identifying Test Points On ECT Sensor Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0183/16567, DTC P1162/17570, DTC P1163/17571 & DTC P1164/17572

Code Definition

DTC P0183/16567
Fuel Temperature Sensor (G81) - Open Circuit/Short To B+

DTC P1162/17570
Fuel Temperature Sensor (G81) - Short To Ground

DTC P1163/17571
Fuel Temperature Sensor (G81) - Open Circuit/Short To B+

DTC P1164/17572
Fuel Temperature Sensor (G81) - Implausible Signal

NOTE: **For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .**

NOTE: **Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.**

NOTE: **Fuel Temperature Sensor (G81) is an integral part of injection pump.**

Possible Effects

Possible effect is increased emissions.

Test Procedures

1. Turn ignition off. Disconnect fuel temperature sensor harness connector, see **COMPONENT LOCATIONS** .
2. Measure resistance between terminals No. 4 and 7 at fuel temperature sensor (component side). See **Fig. 19** . Resistance should vary with temperature changes. For example, resistance should be 1500-2000 ohms at 86°F (30°C) and 275-375 ohms at 176°F (80°C). See **Fig. 17** . If resistance is as specified, go to next step. If resistance is not as specified, replace injection pump. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector, see **CONNECTING VAG TEST BOX** (leave ECM disconnected).
4. **NOTE:** **Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 4 at fuel temperature sensor harness connector and socket No. 103 at test box. See **Fig. 20** . Measure resistance between terminal No. 7 at fuel temperature sensor harness connector and socket No. 111 at test box. Both resistances should be less than 1.5 ohms. If resistances are as specified, go to next step. If any resistance is not as specified, repair open in wiring between fuel temperature sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Measure resistance between terminals No. 4 and 7 at fuel temperature sensor harness connector. Resistance should be infinite. If resistance is as specified, go to next step. If resistance is not as specified, repair circuits shorted to each other between fuel temperature sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST**

DRIVE RELEARN PROCEDURE .

6. Measure resistance between ground and terminals No. 4 and 7 at fuel temperature sensor harness connector. Both resistances should be infinite. If resistances are as specified, go to next step. If any resistance is not as specified, repair short to ground in wiring between fuel temperature sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Measure resistance between positive battery terminal and terminals No. 4 and 7 at fuel temperature sensor harness connector. Both resistances should be infinite. If resistances are as specified, replace ECM. If any resistance is not as specified, repair short to voltage in wiring between fuel temperature sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

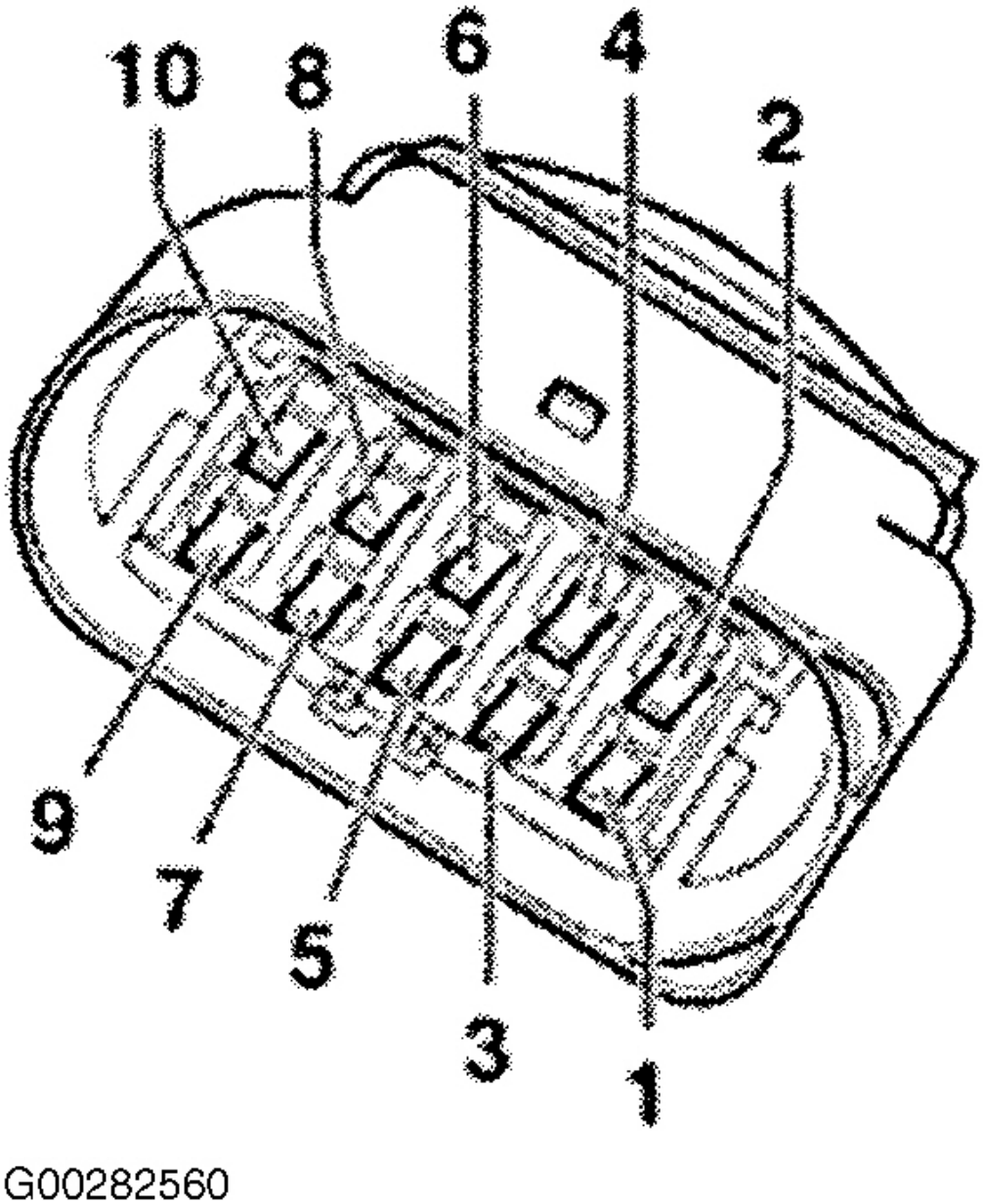


Fig. 19: Identifying 10 Pin Connector Terminals - Component Side
Courtesy of VOLKSWAGEN UNITED STATES, INC.

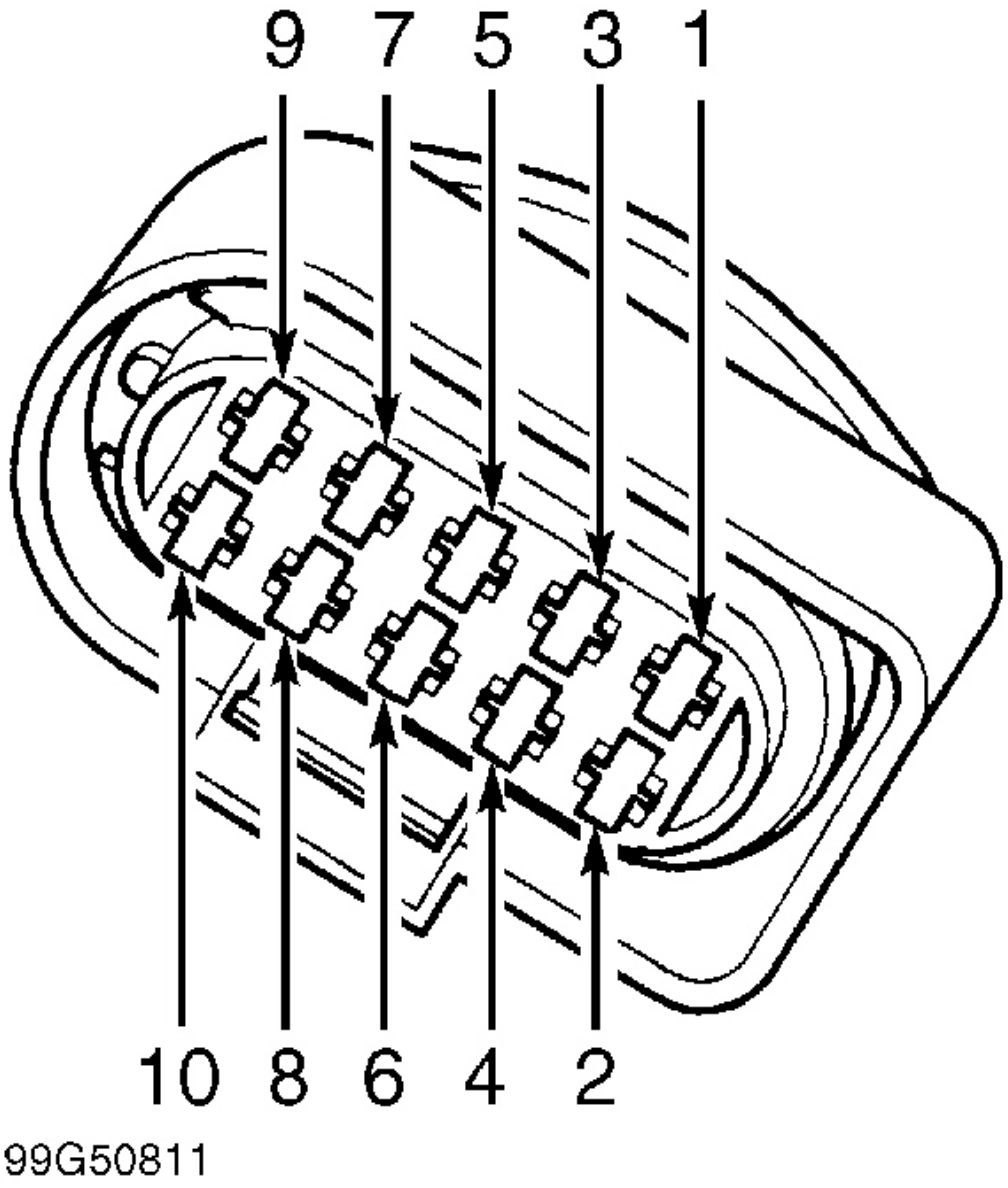


Fig. 20: Identifying Fuel Temperature Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0216/16600, DTC P1251/17659 & DTC P1252/17660

Code Definition

DTC P0216/16600
Cold Start Injector (N108) - Open Circuit/Short To Ground

DTC P1251/17659
Cold Start Injector (N108) - Short To B+

DTC P1252/17660
Cold Start Injector (N108) - Open Circuit/Short To Ground

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are engine knocks during idle and/or poor engine performance.

CAUTION: Conditions that cause DTC P1251/17659 and P1252/17660 to set may cause fuel injection timing to be advanced continuously, this causes engine knock at idle and poor performance. In this condition, Output Diagnostic Test Mode may not affect engine knock or performance, (Output Diagnostic Test Mode advances fuel injection timing).

Test Procedures

1. Let engine idle. Activate Cold Start Injector (N108) using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** . Activation should make a change in combustion that can be heard. If no change in combustion noise is heard, go to next step. If change in combustion noise is heard, go to step 3 .
2. Check injection timing control range. See **DTC P1248/17656: COLD START INJECTOR - CONTROL DIFFERENCE.** . Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete if no DTCs reset.

DTC P0225/16609, DTC P0226/16610, DTC P0228/16612, DTC P1631/18039, DTC P1632/18040, DTC P1639/18047 & DTC P3002/19458

Code Definition

DTC P0225/16609
Throttle Position Sensor (G79) - Supply Voltage Too High/Too Low Or Open Circuit

DTC P0226/16610
Throttle Position Sensor (G79) - Implausible Signal

DTC P0228/16612
Throttle Position Sensor (G79) - Signal Too High

DTC P1631/18039
Throttle Position Sensor (G79) - Signal Too High

DTC P1632/18040
Throttle Position Sensor (G79) - Supply Voltage Too High/Too Low Or Open Circuit

DTC P1639/18047
Throttle Position Sensor (G79) - Implausible Signal

DTC P3002/19458
Kick Down Switch (F8) - Implausible Signal

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are glow plug indicator light blinks and/or increased idle speed.

Test Procedures

NOTE: Throttle Position Sensor (G79) is located by accelerator pedal.

NOTE: Terminal No. 1 at throttle position sensor is only used on vehicles equipped with A/T. On vehicles with A/T, kick down switch must be felt before accelerator pedal is fully depressed. Kickdown switch is an integral part of Throttle Position Sensor (G79); there is no adjustment.

1. Connect scan tool. See **Fig. 1** . Turn ignition on. Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "8" for "Read measuring value block" and enter by pressing "Q" key. Press keys "0", "0" and "2" for display group "2" and enter by pressing "Q" key.
2. Scan tool display should read "Read measuring value block 2". Do not depress accelerator pedal, check throttle position in "display field 2" should be 0 %. At same time check Closed Throttle Position switch in "display field 3", "display field 3" should read "0" "1" "0". Observe "display fields 2 and 3", while slowly depressing accelerator pedal to wide open throttle. At wide open throttle "display field 2" should read 100% and "display field 3" should read "0" "0" "0". Press "right arrow key", press "0" and "6" for "end output" and enter by pressing "Q" key.
3. Turn ignition off. If display field readings did not change or changes where inconsistent, go to next step. If display field readings where consistent but display field specifications could not be obtained, replace faulty Throttle Position Sensor (G79). After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Disconnect Engine Control Module (ECM) harness connectors. ECM is located in left rear corner of engine compartment, in electronics box. Connect VAG 1598/31 test box to ECM harness connector, **CONNECTING VAG TEST BOX** (leave ECM disconnected).
5. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Check for open between harness connector terminals and tests box sockets. See **CHECKING THROTTLE POSITION SENSOR (G79) CIRCUITS** . Also check for short to one and other. Check harness connector terminals for short to B+ and for short to ground. See **CHECKING THROTTLE POSITION SENSOR (G79) CIRCUITS** table. See **Fig. 28** .
6. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

CHECKING THROTTLE POSITION SENSOR (G79) CIRCUITS

Throttle Position Sensor (G79) Harness Connector Terminal	VAG Test Box Socket
1 (1)	63
2	12
3	50
4	69
5	70
6	51
(1) For Automatic Transmission (A/T) Only	

7. Replace faulty Throttle Position Sensor (G79). After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN**

PROCEDURE .

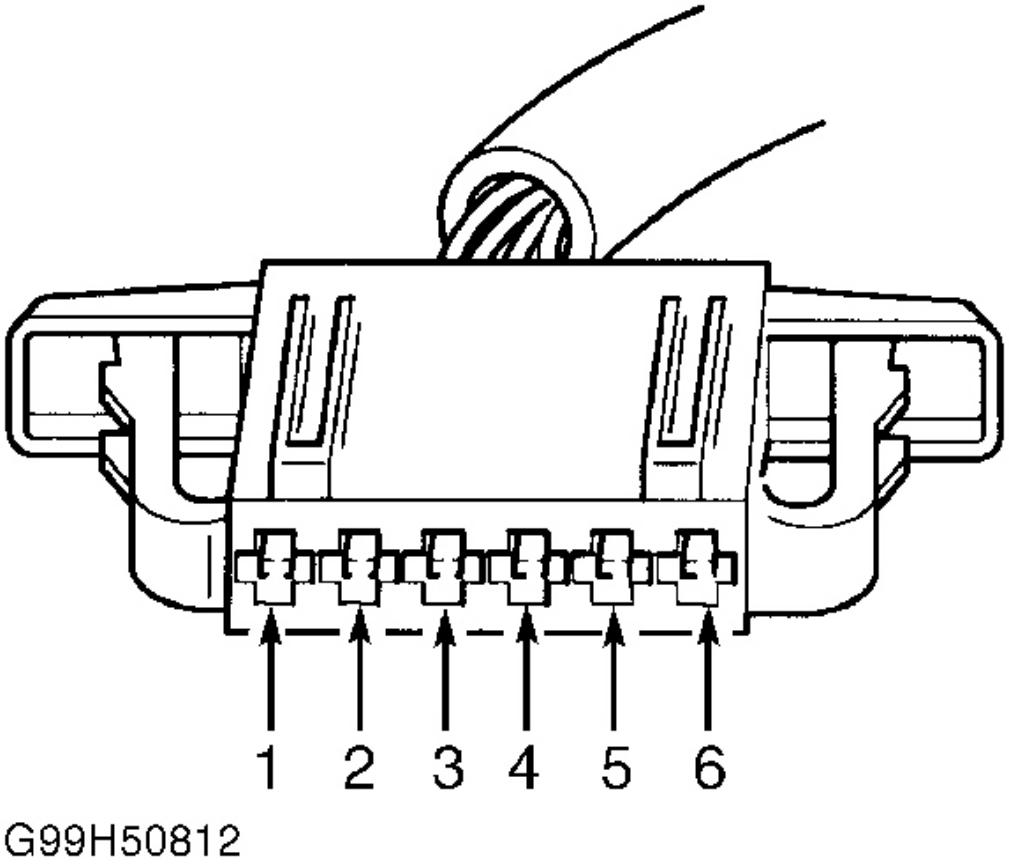


Fig. 21: Identifying Throttle Position Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0234/16618, DTC P1556/17964 & DTC P1557/17965

Code Definition

DTC P0234/16618
Boost Pressure Regulation - Control Limit Exceeded

DTC P1556/17964
Boost Pressure Regulation - Control Limit Not Reached

DTC P1557/17965

Boost Pressure Regulation - Control Limit Exceeded

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effect is boost pressure too high or reduce power.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedures

NOTE: When using scan tool to activate wastegate by-pass regulator valve, it is barely audible. Check by touch or use mechanics stethoscope if necessary.

NOTE: Manufacturer recommends using Scan Tool (VAG 1551/VAG 1552, VAS 5051/VAS 5052) and Test Box (VAG 1598) to diagnose this code. Follow test equipment manufacturer's instructions for operation. If scan tool is not available, check components and wiring for damage. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Connect Scan Tool VAG 1551/1552 or 5051/5052. See **Fig. 1** .
2. Start engine and idle. Using scan tool access "Display group 11". With a helper to operate scan tool from rear seat, accelerate vehicle in 3rd gear from about 1500 RPM to wide open throttle. Press VAG 1551 PRINT button at approximately 3000 RPM. Boost value should be 24.5-32 psi (1.7-2.2 bar). If specified boost pressure is not attained, go to next step.
3. Check Wastegate by-pass regulator valve, see **DTC P0245/1629, P0246/16630, P1546/17954 & P1549/17957** . Repeat turbocharger test. If Wastegate by-pass regulator valve was replaced and boost pressure is still to low, go to next step. If Wastegate by-pass regulator valve was replaced and boost pressure is okay, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. Inspect turbo charger and waste gate, repair or replace as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0245/16629, DTC P0246/16630, DTC P1546/17954 & DTC P1549/17957

Code Definition

DTC P0245/16629
Wastegate By-Pass Regulator Valve (N75) - Open Circuit/Short To Ground

DTC P0246/16630
Wastegate By-Pass Regulator Valve (N75) - Short To Positive

DTC P1546/17954
Wastegate By-Pass Regulator Valve (N75) - Short To Positive

DTC P1549/17957
Wastegate By-Pass Regulator Valve (N75) - Open Circuit/Short To Ground

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are boost pressure too low and/or lack of power.

Test Procedures

NOTE: When using scan tool to activate wastegate by-pass regulator valve, it is barely audible. Check by touch or use mechanics stethoscope if necessary.

1. Turn ignition off. Locate wastegate by-pass regulator valve. See **COMPONENT LOCATIONS** and **Fig. 22** .
2. Disconnect harness connector from wastegate by-pass regulator valve. Measure resistance between wastegate by-pass regulator valve terminals. See **Fig. 22** . If resistance is between 14-20 ohms, go to next step. If resistance is not 14-20 ohms, replace wastegate by-pass regulator valve. After repairs, erase DTC

memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

3. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Connect Scan Tool VAG 1551/1552 or 5051/5052. See **Fig. 1** . Turn ignition on, engine off.
4. Using scan tool, activate wastegate by-pass regulator valve. Wastegate by-pass regulator valve should audibly click. If wastegate by-pass regulator valve does not click, go to next step. If wastegate by-pass regulator valve clicks check vacuum supply to wastegate by-pass regulator valve. Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Disconnect wastegate by-pass regulator valve 2-pin connector. See **Fig. 22** . Turn ignition on, with engine off.
6. Using DVOM and adapter cables from Test Kit (VAG 1594), measure voltage between wastegate by-pass regulator valve 2-pin harness connector terminal 1 and engine ground. Battery voltage should be present. Turn ignition off. If readings are not okay, go to next step. If readings are okay, replace faulty wastegate by-pass regulator valve. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector. Connect Test Box (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** .
8. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Using DVOM, check resistance between the following wastegate by-pass regulator valve (N75) 2-pin harness connector terminals and test box sockets. See **Fig. 30** .

   - Wastegate By-Pass Regulator Valve (N75) harness connector terminal No. 1 and test box socket No. 1.
   - Wastegate By-Pass Regulator Valve (N75) harness connector terminal No. 1 and test box socket No. 2.
   - Wastegate By-Pass Regulator Valve (N75) harness connector terminal No. 2 and test box socket No. 62.
9. Resistance should be a maximum of 1.5 ohms for each reading. If resistance is not okay, repair as necessary. Verify repair. Test is complete. Check wires in wastegate by-pass regulator valve 2-pin harness connector for short circuits to one another, also for short circuits to battery positive and ground. If wiring is not okay, repair as necessary. Verify repair. Test is complete.
10. If resistance is okay and all wiring is okay, replace faulty ECM. See ENGINE CONTROL MODULE under REMOVAL, OVERHAUL & INSTALLATION. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

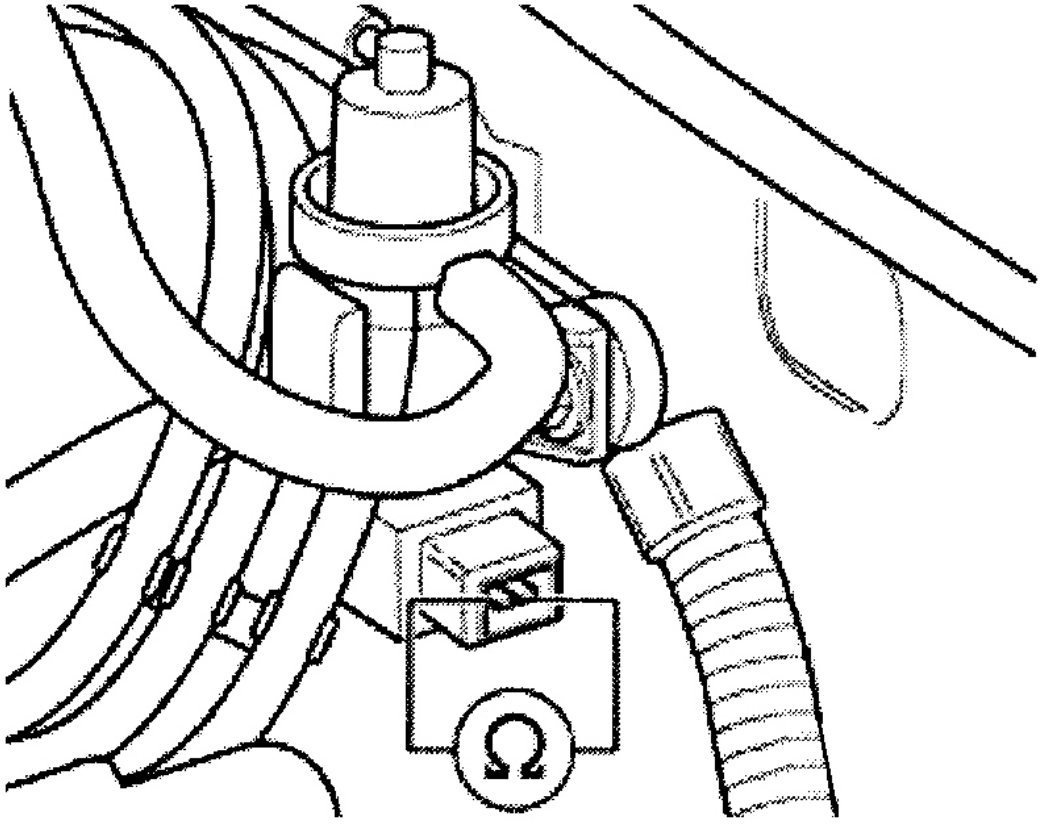


Fig. 22: Identifying Test Points On Wastegate By-Pass Valve (N75) (Golf & Jetta - 1.9L Turbo Diesel)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0300/16684, DTC P0301/16685, DTC P0302/16686, DTC P0303/16687 & DTC P0304/16688

Code Definition

DTC P0300/16684
Misfire Recognized

DTC P0301/16685
Misfire Recognized - Cylinder No. 1

DTC P0302/16686
Misfire Recognized - Cylinder No. 2

DTC P0303/16687

Misfire Recognized - Cylinder No. 3

DTC P0304/16688
Misfire Recognized - Cylinder No. 4

Possible Effects

Possible effect is reduced power. Engine runs rough. Increased emissions.

Test Requirements

Ensure battery voltage is at least 11.5 volts. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Remove engine cover. Disconnect 10-pin electrical connector, on diesel injection pump. See **COMPONENT LOCATIONS** .
2. Disconnect connectors from glow plugs. Remove all glow plugs.
3. **NOTE: Follow manufacturers operating instructions for correct use of compression tester.**

   Thread in VAG 1381/12 adaptor in place of glow plugs. Check compression using VAG 1763 compression tester. Operate starter until tester displays no further increase in pressure. Record compression readings for each cylinder.
4. Check compression readings against specifications. See **COMPRESSION SPECIFICATIONS** table. If any cylinder reading is not as specified, repair as necessary. Glow plug tightening torque is 11 ft. lbs. (15 N.m).

COMPRESSION SPECIFICATIONS

Application	(1) Specification
Normal Compression Pressure (New Engine)	
Beetle, Golf & Jetta	
1.9L Turbo Diesel	363-450 psi (25.0-31.0 bar)
Minimum Compression Pressure	
1.9L Turbo Diesel	276 psi (19.0 bar)
Maximum Variation Between Cylinders	
1.9L Turbo Diesel	73 psi (5.0 bar)
(1) Operate starter until tester shows no further increase.	

DTC P0321/16705 & DTC P0322/16706

Code Definition

DTC 0321/16705
Engine Speed (RPM) Sensor (G28) - Implausible Signal

DTC 0322/16706
Engine Speed (RPM) Sensor (G28) - No Signal

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are engine performance problem, engine stalls and/or glow plug indictor light blinks.

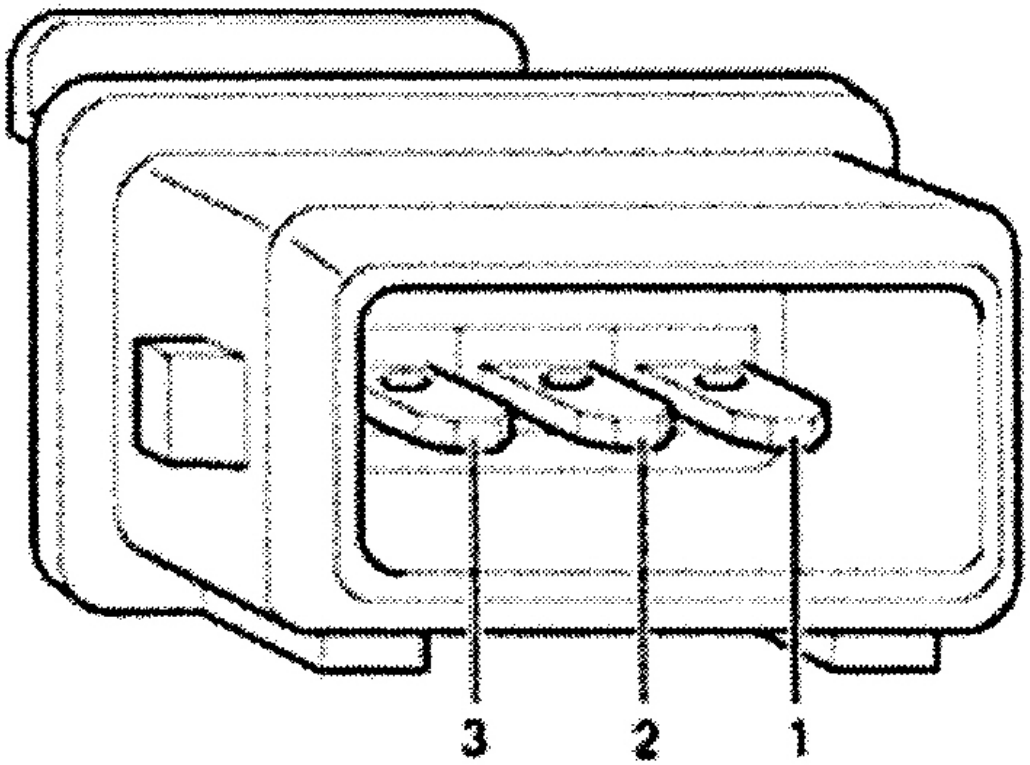
Test Procedures

1. Turn ignition off. Disconnect engine speed sensor harness connector, for location see **Fig. 8** .
2. Measure resistance between terminals No. 1 and 2 at engine speed sensor (component side), see **Fig. 23** . Resistance should be 1100-1600 ohms. If resistance is as specified, go to next step. If resistance is not as specified, replace engine speed sensor. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect Engine Control Module (ECM) harness connector. Connect VAG 1598/31 test box to ECM harness connector, leave ECM disconnected. See **CONNECTING VAG TEST BOX** .
4. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 1 at engine speed sensor harness connector and socket No. 102 at test box. See **Fig. 24** . Measure resistance between terminal No. 2 at engine speed sensor harness connector and socket No. 110 at test box. Measure resistance between terminal No. 3 at engine speed sensor harness connector and socket No. 86 at test box. Resistance should be less than 1.5 ohms for each reading.
5. If resistances are as specified, go to next step. If any resistance is not as specified, repair open in wiring between engine speed sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN**

PROCEDURE .

6. Measure resistance between terminals No. 1, 2 and 3 at engine speed sensor harness connector. See **Fig. 24** . Resistance should be infinite for each reading. If resistances are as specified, go to next step. If any resistance is not as specified, repair circuits shorted to each other between engine speed sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Remove engine speed sensor and check sensor wheel for secure fit, damage and excessive run-out. If engine speed sensor is okay, go to next step. If engine speed sensor is not okay, replace engine speed sensor. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. If speed sensor is okay and resistances are as specified, replace ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00282556

Fig. 23: Identifying Engine Speed Sensor Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

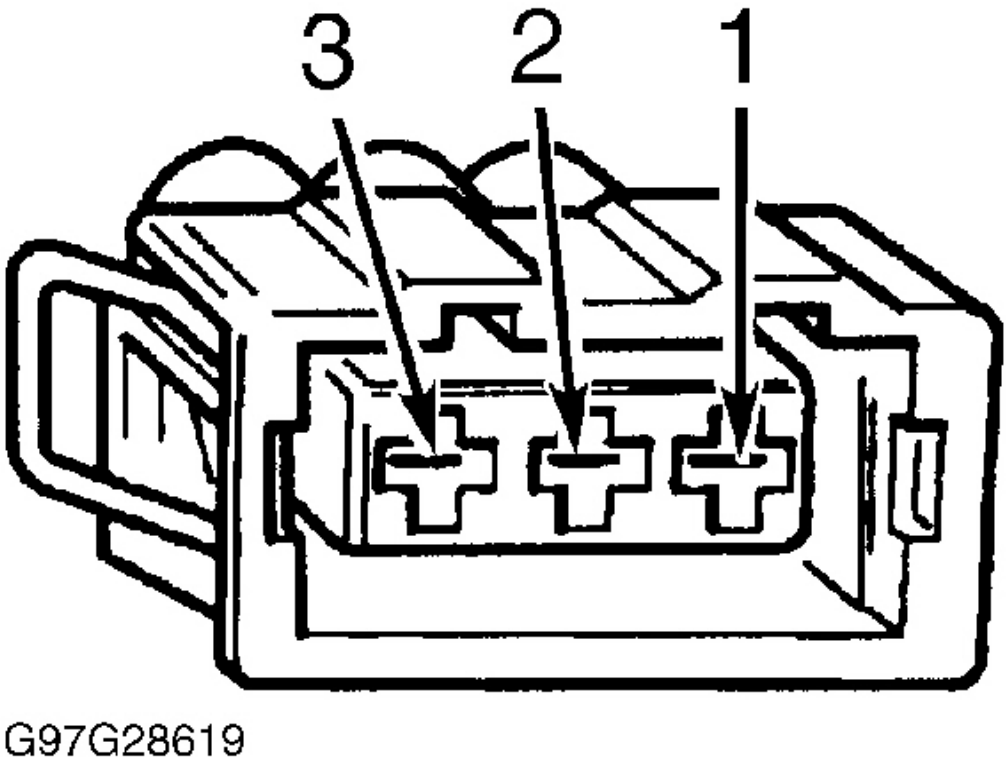


Fig. 24: Identifying Engine Speed Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0380/16764, DTC P1618/18026 & DTC P1619/18027

Code Definition

DTC P0380/16764
Glow Plug Monitoring - No Display

DTC P1618/18026
Glow Plug Relay (J52) - Short To B+

DTC P1619/18027
Glow Plug Relay (J52) - Open Circuit/Short To Ground

NOTE: **For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .**

NOTE: **Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.**

Possible Effects

Possible effects are no glow plug operation and/or engine runs rough when cold.

Test Requirements

Fuses must be okay. Ensure battery voltage is at least 11.5 volts, glow plug fuse strip is okay, glow plug relay is operating properly. A/C and all electrical accessories must be switched off. Alternator must be okay. Engine must be cold.

Test Procedures

1. Check glow plug relay using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** and **COMPONENT LOCATIONS** .
2. If glow plug relay is okay, go to next step. If glow plug relay is not okay, replace as necessary. Erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE:** **Disconnecting engine coolant temperature sensor simulates cold engine.**

   Disconnect engine coolant temperature sensor harness connector. Disconnect glow plug harness connectors. Turn ignition on. Measure voltage between ground and each glow plug harness connector. Voltage should be at least 11.5 volts for approximately 20 seconds after ignition switch is turned on. If voltage is as specified, go to next step. If voltage is not as specified, repair open or short in wiring between glow plugs and glow plug relay. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Using a test light connected to positive battery terminal, touch each glow plug terminal (component side). If test light illuminates, problem is intermittent. If test light does not illuminate, replace appropriate glow plug(s).
5. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0401/16785, DTC P0402/16786, DTC P1402/17810 & DTC P1441/17849

Code Definition

DTC P0401/16785
EGR Vacuum Regulator Solenoid Valve (N18) - Gas Flow Too Low - Short To B+

DTC P0402/16786
EGR Vacuum Regulator Solenoid Valve (N18) - Gas Flow Too High - Short To B+

DTC P1402/17810
EGR Vacuum Regulator Solenoid Valve (N18) - Short To B+

DTC P1441/17849
EGR Vacuum Regulator Solenoid Valve (N18) - Open Circuit/Short To Ground

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are poor idle black smoke and/or EGR system malfunction.

NOTE: EGR Vacuum Regulator Solenoid Valve (N18), with condition short to ground may give to much EGR; open circuit or short to B+ will not.

NOTE: When using scan tool in Output Diagnostic Test Mode (DTM) to activate engine components, some components may be barely audible. Check component by touch or use mechanics stethoscope if necessary.

Test Procedures

1. Use Output Diagnostic Test Mode to check Exhaust Gas Regulator Valve (N18). See **OUTPUT DIAGNOSTIC TEST MODE** .
2. If valve does not click, go to next step. If valve clicks, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no DTC resets, test is complete.

3. Turn ignition off. Disconnect EGR vacuum regulator solenoid valve harness connector. See **COMPONENT LOCATIONS** .
4. Measure resistance between terminals No. 1 and 2 at EGR vacuum regulator solenoid valve (component side). Resistance should be 14-20 ohms. If resistance is as specified, go to next step. If resistance is not as specified, replace EGR vacuum regulator solenoid valve. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition on. Measure voltage between ground and terminal No. 1 at EGR valve harness connector, see **COMPONENT LOCATIONS** and **Fig. 30** . Voltage should be at least 11.5 volts. If voltage is as specified, go to next step. If voltage is not as specified, repair open in wiring between EGR vacuum regulator solenoid valve and fuse box. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector. See **CONNECTING VAG TEST BOX** (leave ECM disconnected).
7. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 1 at EGR valve harness connector and socket No. 1 at test box. See **Fig. 30** . Measure resistance between terminal No. 1 at EGR valve harness connector and socket No. 2 at test box. Measure resistance between terminal No. 2 at EGR valve harness connector and socket No. 61 at test box. Resistance should be less than 1.5 ohms for each reading. If resistance is as specified, go to next step. If any resistance is not as specified, repair open in wiring between 2 pin EGR valve harness connector and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check 2 pin EGR valve harness connector terminals No. 1 and 2 short to one and other. Check terminals No. 1 and 2 for short to B+. Check terminals No. 1 and 2 for short to ground. If wiring is okay, go to next step. If wiring is not okay, repair short circuit(s) as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. If all wiring is okay and voltage is okay at 2 pin EGR valve harness connector terminal No. 1. See 5 . Replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0501/16885 & DTC P1540/17948

Code Definition

DTC P0501/16885
Vehicle Speed Sensor (VSS) - Implausible Signal

DTC P1540/17948
Vehicle Speed Signal (VSS) - Signal To High

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

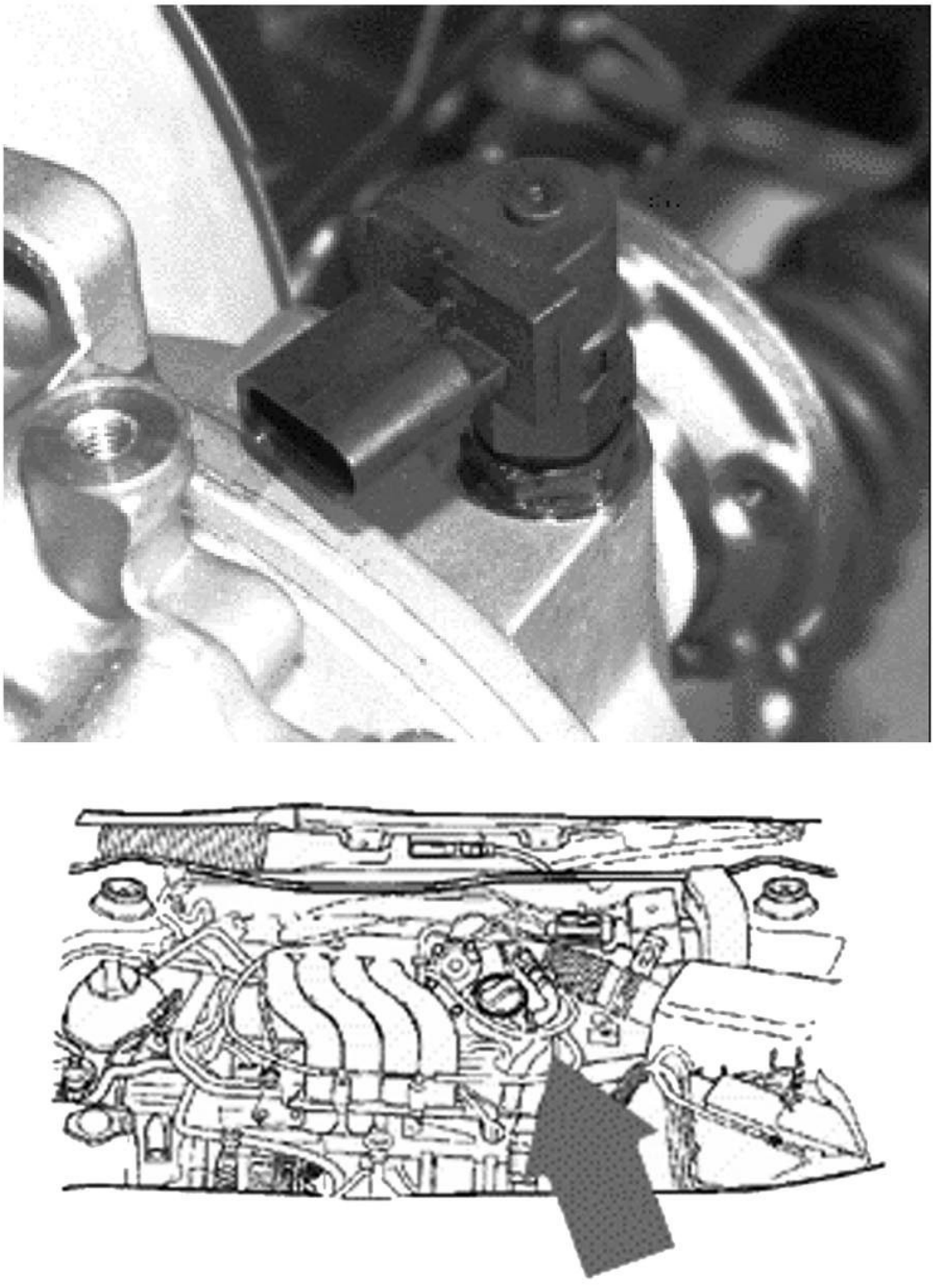
Possible Effects

Possible effects are speedometer does not operate, cruise control system does not operate, vehicle bucks during shifting and A/C system may not operate.

Test Procedures

1. Check speedometer operation. If speedometer operates properly, go to next step. If speedometer does not operate properly, repair speedometer as necessary.
2. Turn ignition off. Disconnect Engine Control Module (ECM) harness connector. Connect VAG 1598/31 test box to ECM harness connector. Leave ECM disconnected. See **CONNECTING VAG TEST BOX** .
3. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Raise and support left front of vehicle. Connect a diode test light between sockets No. 4 and 20 at test box. See **Fig. 25** and **Fig. 26** .
4. Turn ignition on, with engine off. Rotate left front wheel while observing test light. If test light blinks, VSS signal is okay. If test light does not blink, check wiring from VSS and between instrument cluster and ECM for open or short circuits. If wiring is okay go to next step. If wiring is not okay. Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Check VSS. Replace if faulty. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00282557

Fig. 25: Locating Vehicle Speed Sensor - Manual Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

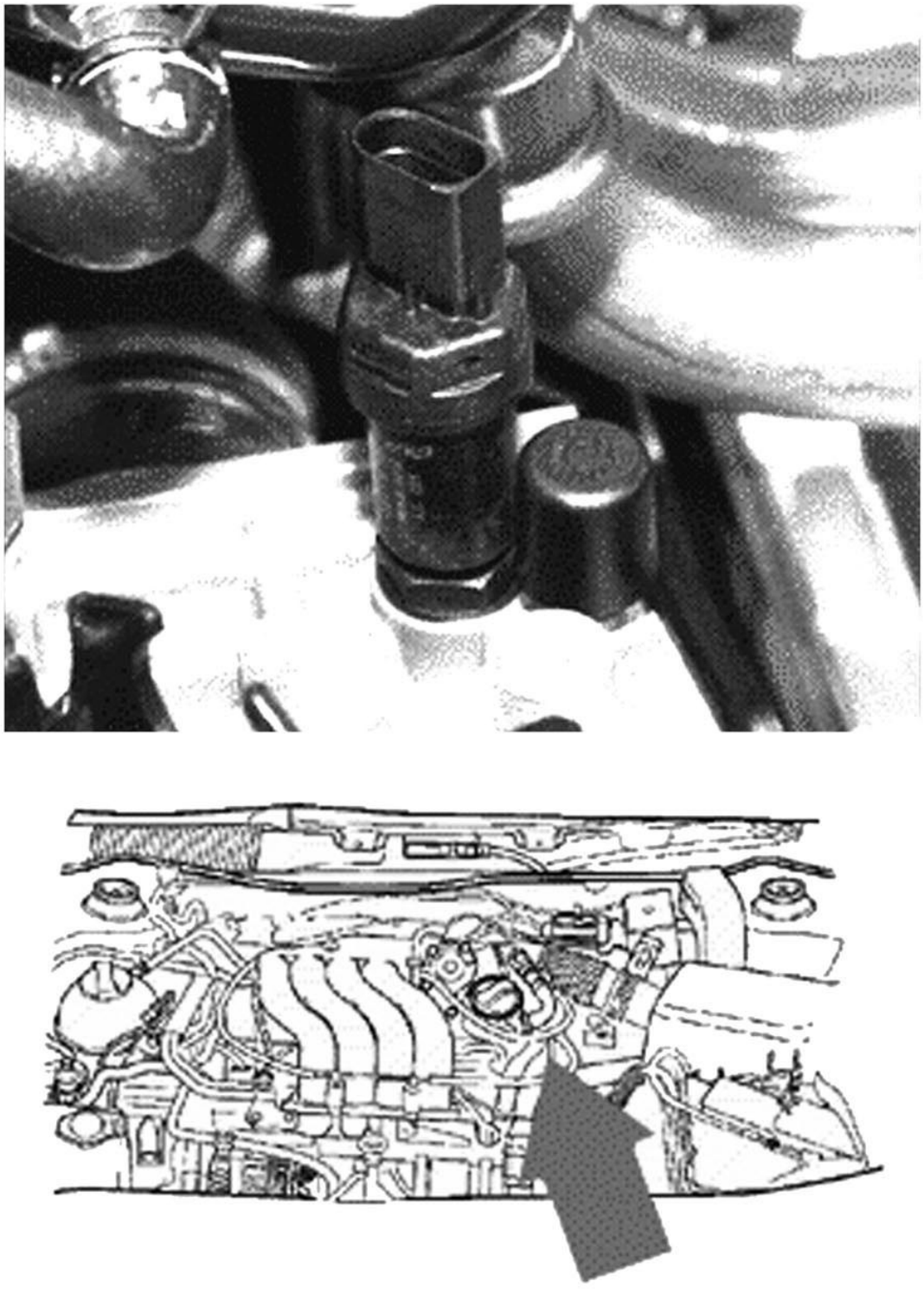


Fig. 26: Locating Vehicle Speed Sensor - Automatic Transmission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0571/16955 & VAG DTC 00741

Code Definition

DTC P0571/16955
Brake Light Switch - Implausible Signal

VAG DTC 00741

NOTE: DTC 00741 is displayed in VW factory scan tool format only.

Brake Pedal Monitoring - Implausible Signal

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are incorrect engine speed regulation. ECM requires signals from brake light switch and also the brake pedal switch to regulate engine speed.

Test Procedures

1. Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.
2. Turn ignition on, engine off. Connect scan tool, see **Fig. 1** . Press keys "0" and "1" for address word "Engine Electronics".
3. Press "right arrow" key, press keys "0" and "8" for "Read measured value block" and enter by pressing "Q" key. Press keys "0", "0" and "6" for display group "6" and enter by pressing "Q" key. "Display field "2" should read "000". Depress brake pedal slowly "Display field 2" should read "011", 00s should have switched to 11s at same instance off time. Release brake pedal slowly to rest position. "Display field "2" should read "000". Press "right arrow" key. Press keys "0" and "6" for function "End output", and enter by pressing "Q" key. If "Display field "2" readings are not okay, go to next step. If "Display field "2" readings are okay Erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete if no DTCs reset.
4. Remove driver's side knee bolster. Disconnect brake light switch/brake pedal switch 4-pin harness connector. See **Fig. 27** .

5. Using DVOM, measure resistance between brake light switch/brake pedal switch terminals No. 1 and 4 (component side). Resistance should be infinity. If resistance is as specified, leave DVOM connected and go to next step. If resistance is not as specified, replace or adjust brake light/brake pedal switch as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Depress brake pedal. Resistance should be maximum 1.5 ohms. If resistance is as specified, go to next step. If resistance is not as specified, replace or adjust brake light/brake pedal switch as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Using DVOM, measure resistance between brake light switch/brake pedal switch terminals No. 2 and 3. Resistance should be maximum 1.5 ohms. If resistance is as specified, leave DVOM connected and go to next step. If resistance is not as specified, replace or adjust brake light/brake pedal switch as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Depress accelerator pedal. Resistance should be infinity. If resistance is as specified, go to next step. If resistance is not as specified, replace or adjust brake light/brake pedal switch as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Turn ignition on. Using DVOM, check voltage at brake light switch/brake pedal switch harness connector terminal No. 1 and ground. See **Fig. 28** . Check voltage at harness connector terminal No. 2 and ground. Minimum of 11.5 volts should be present. If both test are okay, go to step 13 . If one or both tests are not okay, go to next step.
10. Check for open or short to ground in brake light/brake pedal harness connector No. 1 and Main fuse. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. If problem is found, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
11. Disconnect Engine Control Module (ECM) harness connectors. ECM is located in left rear corner of engine compartment, in electronics box. Connect VAG 1598/31 test box to ECM harness connector, **CONNECTING VAG TEST BOX** (leave ECM disconnected).
12. Check for open, short to voltage or short to ground between specified terminals. See **CHECKING BRAKE LIGHT SWITCH/BRAKE PEDAL SWITCH CIRCUITS** table. See **Fig. 28** .
13. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

    If problem is found, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

CHECKING BRAKE LIGHT SWITCH/BRAKE PEDAL SWITCH CIRCUITS

Brake Light Switch/Brake Pedal Switch Harness Connector Terminal	VAG Test Box Socket
2	2
2	1
3	65
4	32

14. If brake light switch/brake pedal switch and all wiring is okay, replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

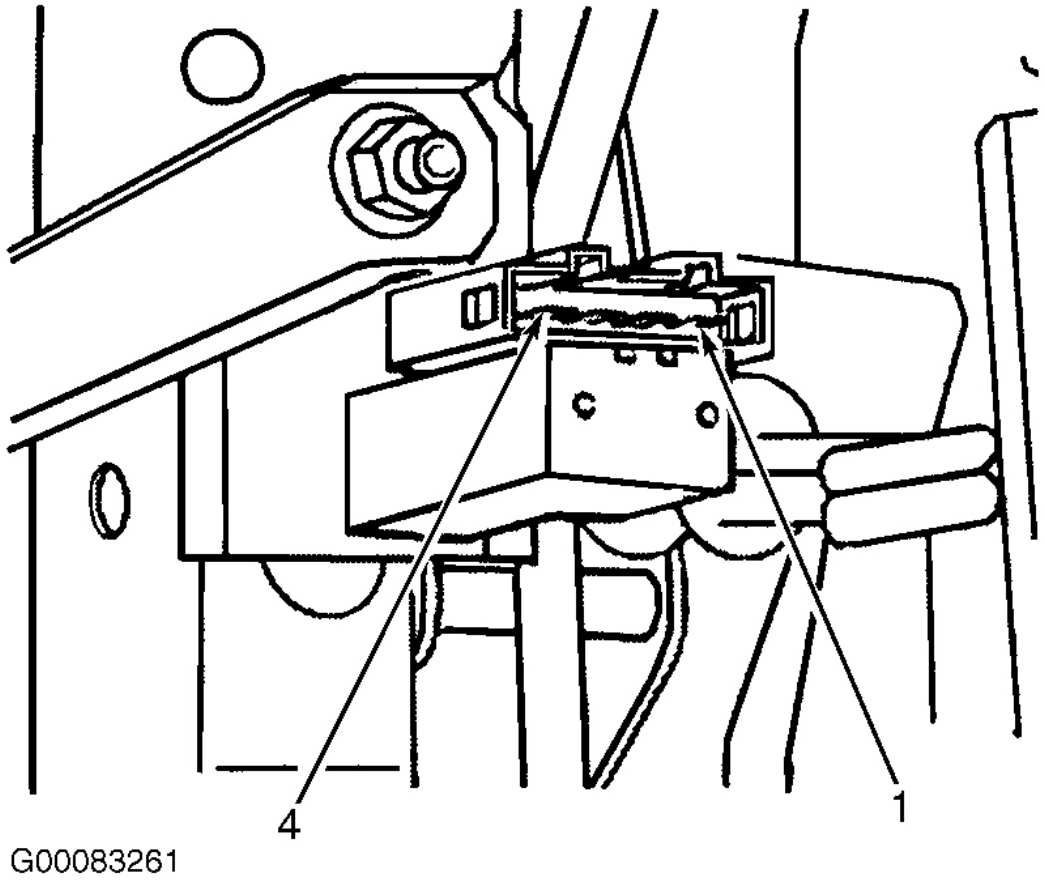


Fig. 27: Identifying Test Points On Brake Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

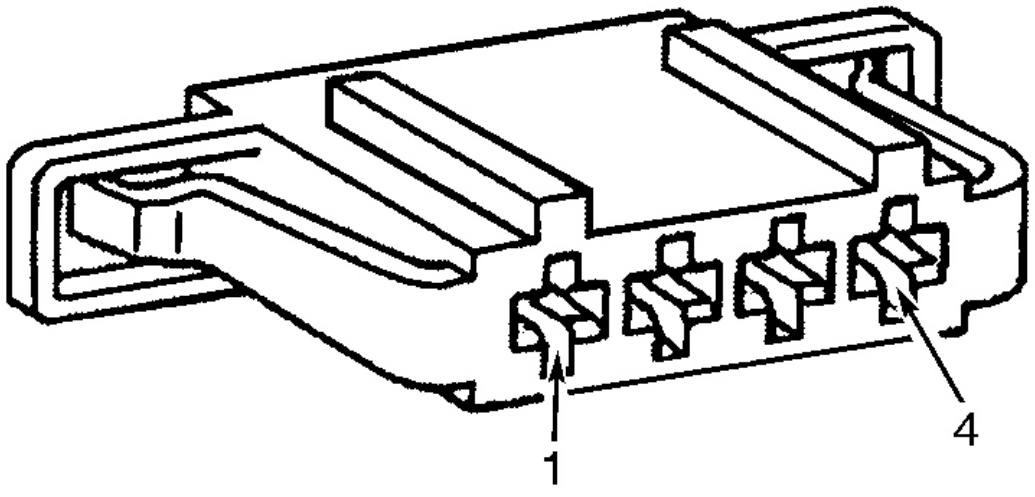


Fig. 28: Identifying Test Points On Brake Switch Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0601/16985, DTC P0605/16989, DTC P0606/16990, DTC P1387/17795 & DTC P1640/18048

Code Definition

DTC P0601/16985
ECM (J248) - Inoperative

DTC P0605/16989
ECM (J248) - Inoperative

DTC P0606/16990
ECM (J248) - Inoperative

DTC P1387/17795
ECM (J248) - Inoperative

DTC P1640/18048
ECM (J248) - Inoperative

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: **Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.**

Possible Effects

Possible effects are poor engine performance, engine may not start and/or engine stalls.

Test Procedures

No test procedure is required for this fault code. Replace Engine Control Module (ECM).

NOTE: **Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

DTC P0670/17054, DTC P0671/17055, DTC P0672/17056, DTC P0673/17057, DTC P0674/17058 & DTC P0684/17068

Code Definition

DTC P0670/17054
Glow Plug Control Module (J370) - Open Circuit/Short To Ground

DTC P0671/17055
Glow Plug Cylinder No. 1 - Open Circuit/Short To Ground

DTC P0672/17056
Glow Plug Cylinder No. 2 - Open Circuit/Short To Ground

DTC P0673/17057
Glow Plug Cylinder No. 3 - Open Circuit/Short To Ground

DTC P0674/17058
Glow Plug Cylinder No. 4 - Open Circuit/Short To Ground

DTC P0684/17068
Glow Plug Control Module (J370) - Open Circuit To ECM

NOTE: **For connector terminal wire colors, see appropriate ENGINE PERFORMANCE wiring diagram in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .**

NOTE: **Before replacing any component, ensure all connectors at component and ECM**

are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are no glow plug operation and/or engine runs rough when cold.

Test Requirements

Fuses must be okay. Ensure battery voltage is at least 11.5 volts, glow plug fuse strip is okay, glow plug relay is operating properly. A/C and all electrical accessories must be switched off. Alternator must be okay. Engine must be cold.

Test Procedures

1. Check wiring going to Glow Plug Control Module (J370). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.
2. If wiring going to Glow Plug Control Module (J370) is okay, go to next step. If wiring is NOT okay, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: Test must be done within 3 minutes after starting engine.**

   Engine must be cold. Start the engine and run at idling speed. Connect VAG 1715 Multimeter in sequence to glow plug wire for each cylinder using current pick-up clamp. Record each reading. Specified value is minimum of 6 amps for each reading. If specification is obtained, go to next step. If specification is not obtained, check and repair wiring going to Glow Plug Control Module (J370). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect glow plug harness connectors. Check glow plugs using diode test lamp. Connect diode test lamp to battery positive (+). Probe each glow plug terminal. Diode test lamp should light up. If diode test lamp does not light up, replace glow plug. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Tightening torque for glow plugs are 11 ft. lbs. (15 N.m).

DTC P1160/17568 & DTC P1161/17569

Code Definition

DTC P1160/17568

IAT Sensor (G72) - Short To Ground

DTC P1161/17569
IAT Sensor (G72) - Open Circuit/Short To B+

NOTE: IAT sensor in an integral part of Manifold Absolute Pressure (MAP) sensor.

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see Fig. 14 .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effect is engine pre-heating not functioning.

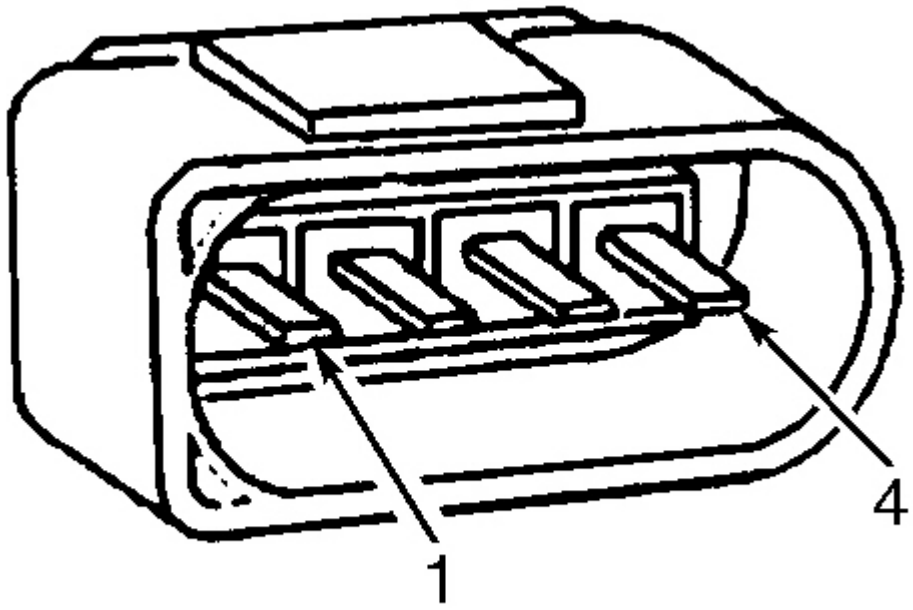
Test Procedures

1. Turn ignition off. Disconnect MAP/IAT sensor harness connector.
2. Measure resistance between terminals No. 1 and 2 at MAP/IAT sensor (component side). Resistance should be 1500-2000 ohms at 86°F (30°C) and 275-375 ohms at 176°F (80°C). See **Fig. 29** and **Fig. 17** . If resistance is as specified, go to next step. If resistance is not as specified, replace MAP/IAT sensor. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector. See **CONNECTING VAG TEST BOX** (leave ECM disconnected).
4. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 1 at MAP/IAT sensor harness connector and socket No. 52 at test box. See **Fig. 14** and **Fig. 15** . Measure resistance between terminal No. 2 at MAP/IAT sensor harness connector and socket No. 73 at test box. Both resistances should be less than 1.5 ohms. If resistances are as specified, go to next step. If any resistance is not as specified, repair open in wiring between MAP/IAT sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Measure resistance between terminals No. 1 and 2 at MAP/IAT sensor harness connector. Resistance should be infinite. If resistance is as specified, go to next step. If resistance is not as specified, repair circuits shorted to each other between MAP/IAT sensor and ECM. After repairs, erase DTC memory. See

CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05) under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Measure resistance between ground and terminals No. 1 and 2 at MAP/IAT sensor harness connector. Both resistances should be infinite. If resistances are as specified, go to next step. If any resistance is not as specified, repair short to ground in wiring between MAP/IAT sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Measure resistance between positive battery terminal and terminals No. 1 and 2 at MAP/IAT sensor harness connector. Both resistances should be infinite. If resistances are as specified, replace ECM. If any resistance is not as specified, repair short to voltage in wiring between MAP/IAT sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083387

Fig. 29: Identifying MAP/IAT Sensor Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1245/17653, DTC P1246/17654 & DTC P1247/17655

Code Definition

DTC P1245/17653
Needle Lift Sensor (G80) - Short To Ground

DTC P1246/17654
Needle Lift Sensor (G80) - Implausible Signal

DTC P1247/17655
Needle Lift Sensor (G80) - Open Circuit/Short To B+

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are glow plug indictor light blinks, engine runs rough, lack of power and/or increased emissions.

Test Procedures

1. Turn ignition off. Disconnect needle lift sensor harness connector. Needle Lift Sensor (G80) is located on No. 3 injector.
2. Measure resistance between terminals No. 1 and 2 at needle lift sensor (component side). Resistance should be 80-120 ohms. If resistance is as specified, go to next step. If resistance is not as specified, replace needle lift sensor with No. 3 injector. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector, see **CONNECTING VAG TEST BOX** (leave ECM disconnected).
4. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 1 at needle lift sensor harness connector and socket No. 109 at test box. See **Fig. 30** . Measure resistance between terminal No. 2 at needle lift sensor harness connector and socket No. 101 at test box. Both resistances should be less than 1.5 ohms. If resistances are as specified, go to next step. If any resistance is not as specified, repair open in wiring between needle lift sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Measure resistance between terminals No. 1 and 2 at needle lift sensor harness connector. See **Fig. 30** . Resistance should be infinite. If resistance is as specified, go to next step. If resistance is not as specified, repair circuits shorted to each other between needle lift sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST**

DRIVE RELEARN PROCEDURE .

6. Measure resistance between ground and terminals No. 1 and 2 at needle lift sensor harness connector. Both resistances should be infinite. If resistances are as specified, go to next step. If any resistance is not as specified, repair short to ground in wiring between needle lift sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Measure resistance between positive battery terminal and terminals No. 1 and 2 at needle lift sensor harness connector. Both resistances should be infinite.
8. If any resistance is not as specified, repair short to voltage in wiring between needle lift sensor and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistances are as specified, replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

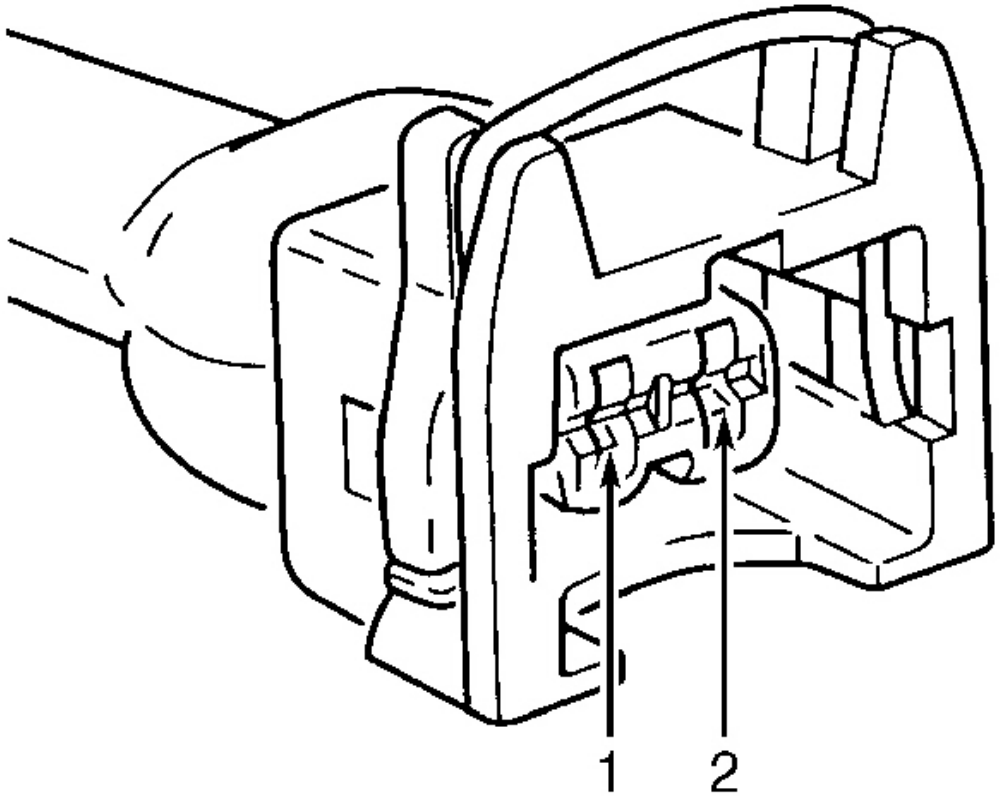


Fig. 30: Identifying Test Points On 2-Pin Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1248/17656: COLD START INJECTOR (N108) - CONTROL DIFFERENCE

NOTE: **For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .**

NOTE: **Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.**

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Possible Effects

Possible effects are engine runs rough, lack of power, increased emissions and/or poor cold start performance.

Test Procedures

1. Ensure there is adequate fuel in tank. Ensure fuel filter is not plugged. Check for air in fuel system. If problem does not exist, go to next step. If problem exists, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: This procedure is used to check Diesel injection timing control range.**

   Let engine idle. Connect scan tool. See **Fig. 1** . Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "4" for "Basic setting" and enter by pressing "Q" key. Press keys "0", "0" and "4" for display group "4" and enter by pressing "Q" key. Press keys "0" and "6" for "End output" and enter by pressing "Q" key.
3. Specified value in "display field 3" of scan tool is 7° to 9° BTDC. In approximately 10 seconds "display field 3" should change into 3° to 5°. Turn ignition off. If specification is okay, go to step 5 . If specification is not obtained, go to next step.
4. Turn ignition off. To check cold start injector, disconnect 10 pin connector. See **COMPONENT LOCATIONS** . Measure resistance between terminals 9 and 10 (component side). See **Fig. 19** . Resistance should be 12 to 20 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty Cold Start Injector (N108). See **COMPONENT LOCATIONS** . After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector. See **CONNECTING VAG TEST BOX** (leave ECM disconnected).
6. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 9 at 10 pin harness connector and socket No. 114 at test box. See **Fig. 20** . Measure resistance between terminal No. 10 at 10 pin harness connector and socket No. 1 at test box. Measure resistance between terminal No. 10 at 10 pin harness connector and socket No. 2 at test box. Resistance should be less than 1.5 ohms for each reading. If resistance is as specified, go to next step. If any resistance is not as specified, repair open in wiring between 10 pin Cold Start Injector (N108) harness connector and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is

complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check terminals No. 9 and 10 for short to each other. Check terminals No. 9 and 10 for short to B+. Check terminals No. 9 and 10 for short to ground. If wiring is okay, go to next step. If wiring is not okay, repair short circuit(s) as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check Needle Lift Sensor (G80). See **DTC P1245/17653, P1246/17654 & P1247/17655** . If Needle Lift Sensor (G80) is okay, go to next step. If Needle Lift Sensor (G80) is not okay, replace Needle Lift Sensor (G80) and No. 3 fuel injector. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1354/17762: MODULATING PISTON DISPLACEMENT SENSOR (G149) - ELECTRICAL MALFUNCTION IN CIRCUIT

NOTE: Modulating Piston Displacement Sensor (G149) is an integral part of injection pump.

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are poor engine performance, engine stalling, engine will not start, or glow plug indicator lamp may flash.

Test Procedures

1. Turn ignition off. Connect scan tool, see **Fig. 1** . Start engine and let engine idle. Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "8" for "Read measuring value block". Enter by pressing "Q" key. Press keys "0", "0" and "1" for display group "1" and enter by pressing "Q" key.
2. Scan tool display should read "Read measuring value block 1". Coolant temperature readout in "display field 4" must be minimum of 185° F (85° C), voltage reading in "display field 3" should be 1.450 to 2.000 volts. Press "right arrow key", press "0" and "6" for "end output" and enter by pressing "Q" key. If voltage reading is not okay, go to next step. If voltage reading is okay, erase DTC memory. See

CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05) under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no DTC resets, test is complete.

3. Turn ignition off. Disconnect Modulating Piston Displacement Sensor (G149) 10 pin harness connector, see **COMPONENT LOCATIONS** .
4. Measure resistance between terminals No. 1 and 2 at Modulating Piston Displacement Sensor (G149). See **Fig. 19** (component side). Measure resistance between terminals No. 2 and 3 at fuel temperature sensor (component side). Resistance should be 4.9-7.5 ohms for each reading. If resistance is as specified, go to next step. If resistance is not as specified, replace injection pump. See appropriate ENGINE MECHANICAL article in ENGINES. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector, see **CONNECTING VAG TEST BOX** (leave ECM disconnected).
6. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 1 at 10 pin harness connector and socket No. 108 at test box. See **Fig. 20** . Measure resistance between terminal No. 2 at 10 pin harness connector and socket No. 106 at test box. Measure resistance between terminal No. 3 at 10 pin harness connector and socket No. 99 at test box. Resistance should be less than 1.5 ohms for each reading. If resistance is as specified, go to next step. If any resistance is not as specified, repair open in wiring between 10 pin Modulating Piston Displacement Sensor (G149) harness connector and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Check 10 pin Modulating Piston Displacement Sensor (G149) harness connector terminals No. 1, No. 2 and 3 for short to one another. Check terminals No. 1, No. 2 and 3 for short to B+. Check terminals No. 1, No. 2 and 3 for short to ground. If wiring is okay, go to next step. If wiring is not okay, repair short circuit(s) as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1403/17811: EGR SYSTEM - CONTROL DIFFERENCE

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness

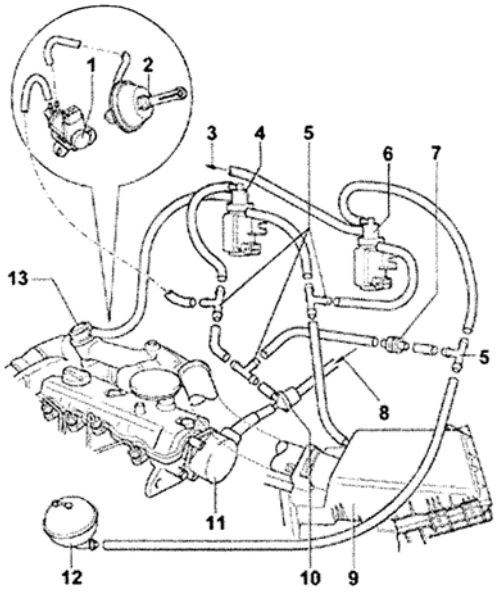
connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are black smoke, EGR system malfunction and/or lack of power.

Test Procedures

1. Check air induction and vacuum hoses for leaks. Check vacuum hoses for proper routing. See **Fig. 31** . If vacuum hoses are routed properly and no air or vacuum leaks are found, go to next step. If vacuum hoses are not routed properly and/or air or vacuum leaks are found, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check EGR valve for proper operation and free movement using manual vacuum pump. If EGR operation is okay, go to next step. If EGR operation is not okay, replace EGR valve. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check EGR Vacuum Regulator Solenoid Valve (N18). See **DTC P401/16785, P402/16786, P1402/17810 & P1441/17849** .



1 - Change-over Valve for Intake Manifold Flap (N239)

2 - Vacuum actuator

- Do not bend control rod

3 - Vacuum hose

- To vacuum unit for boost regulation on turbocharger

4 - EGR Vacuum Regulator Solenoid Valve (N18)

5 - T-connector

6 - Wastegate Bypass Regulator Valve (N75)

7 - Check valve

- Observe installation position: White connection points toward T-connector wastegate regulator valve and vacuum reservoir.

8 - From brake booster

9 - Air cleaner

10 - Check valve

- Observe installation position

11 - Vacuum pump

- For brake booster

12 - Vacuum reservoir

- Mounted with bracket to oil pan

13 - EGR Valve

G00282561

Fig. 31: Vacuum Hose Diagram
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1503/17911 & VAG DTC 01117

Code Definition

DTC P1503/17911
Load Signal For Generator DF - Implausible Signal

VAG DTC 01117

NOTE: DTC 00668 is displayed in VW factory scan tool format only.

Load Signal For Generator DF - Implausible Signal

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component

locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

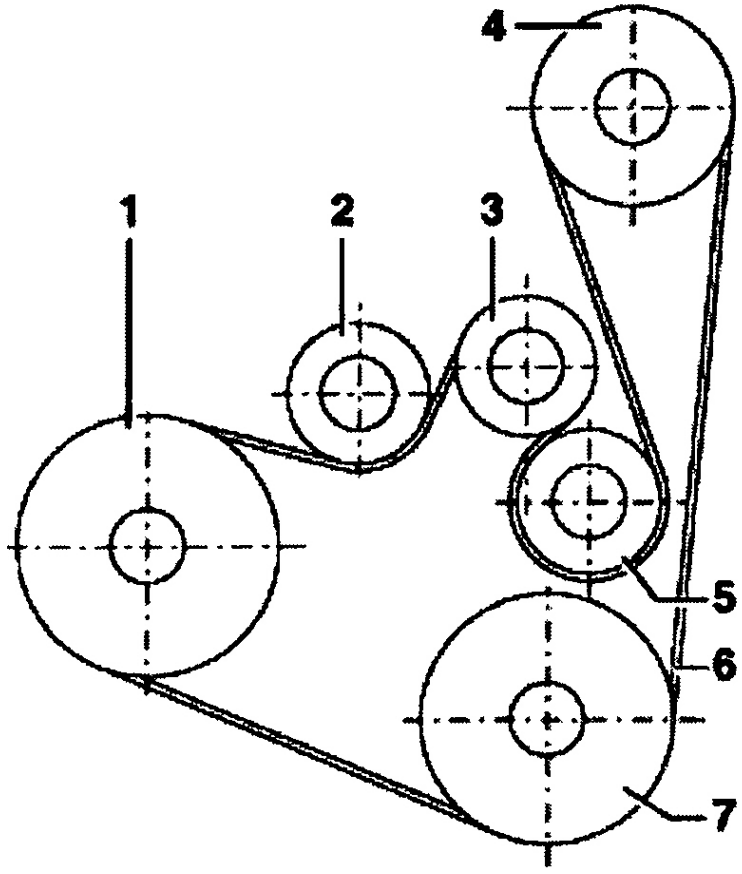
Possible Effects

Engine warm-up (pre-heat inoperative).

NOTE: Testing procedure is for 2002-2004 generator w/serviceable voltage regulator/brushes only.

Test Procedures

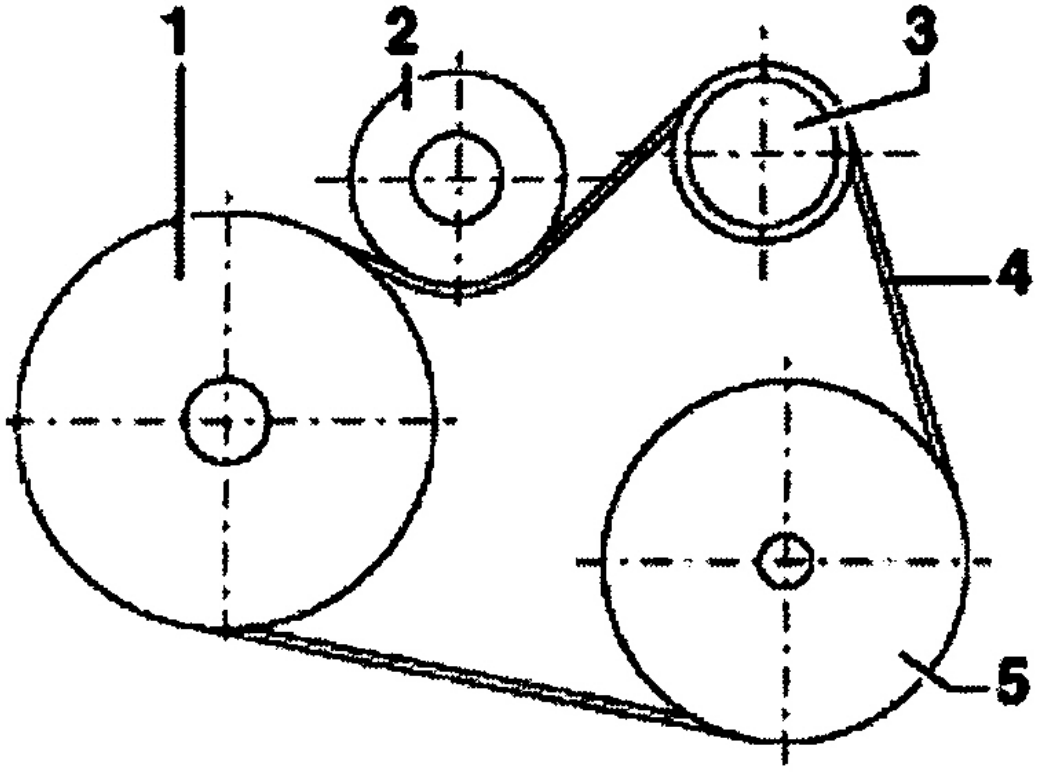
1. Check ground connection between engine, body, battery positive, ground and all electrical connections on generator. Check battery cables for corrosion. If no repair is needed, go to next step. If repairs are needed, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Ensure generator belt tension and mounting are okay. See **Fig. 32** or **Fig. 33** .



1- Vibration damper/pulley
2- Tensioner
3- Pulley-generator
4- Pulley-power steering pump
5- Idler pulley
6- Ribbed belt
7- Pulley-A/C compressor

G00027341

Fig. 32: Drive Belt Routing (With A/C)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1- Vibration damper/pulley
2- Tensioner
3- Pulley-generator
4- Ribbed belt
5- Pulley-power steering pump

G00027342

Fig. 33: Drive Belt Routing (Without A/C)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

3.

NOTE: **Generator freewheeling pulley clutch is identified by protective cap in center of generator pulley. Freewheeling pulley clutch momentarily freewheels when variable load is applied to drive belt, A/C or switching on high current electrical consumers. Freewheeling pulley clutch ensures that belt driving force to generator is applied in clockwise rotation only. When checking freewheeling clutch, 6 mm allen socket is not used, 6 mm allen socket is used for removal and installation only.**

Check function of generator pulley freewheeling clutch (if equipped). To check freewheeling clutch, multi-tooth socket 3400 and 17mm wrench are needed. Turn generator input shaft counterclockwise using multi-tooth socket 3400 and 17mm wrench. See **Fig. 34** . If input shaft and outside of pulley turns no repair is necessary, go to next step. If only input shaft turns and outside of pulley does not turn, replace faulty freewheeling clutch w/pulley. See **GENERATORS & REGULATORS - FROM LATE 1999 PRODUCTION** or **GENERATORS & REGULATORS - NEW BEETLE** . After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

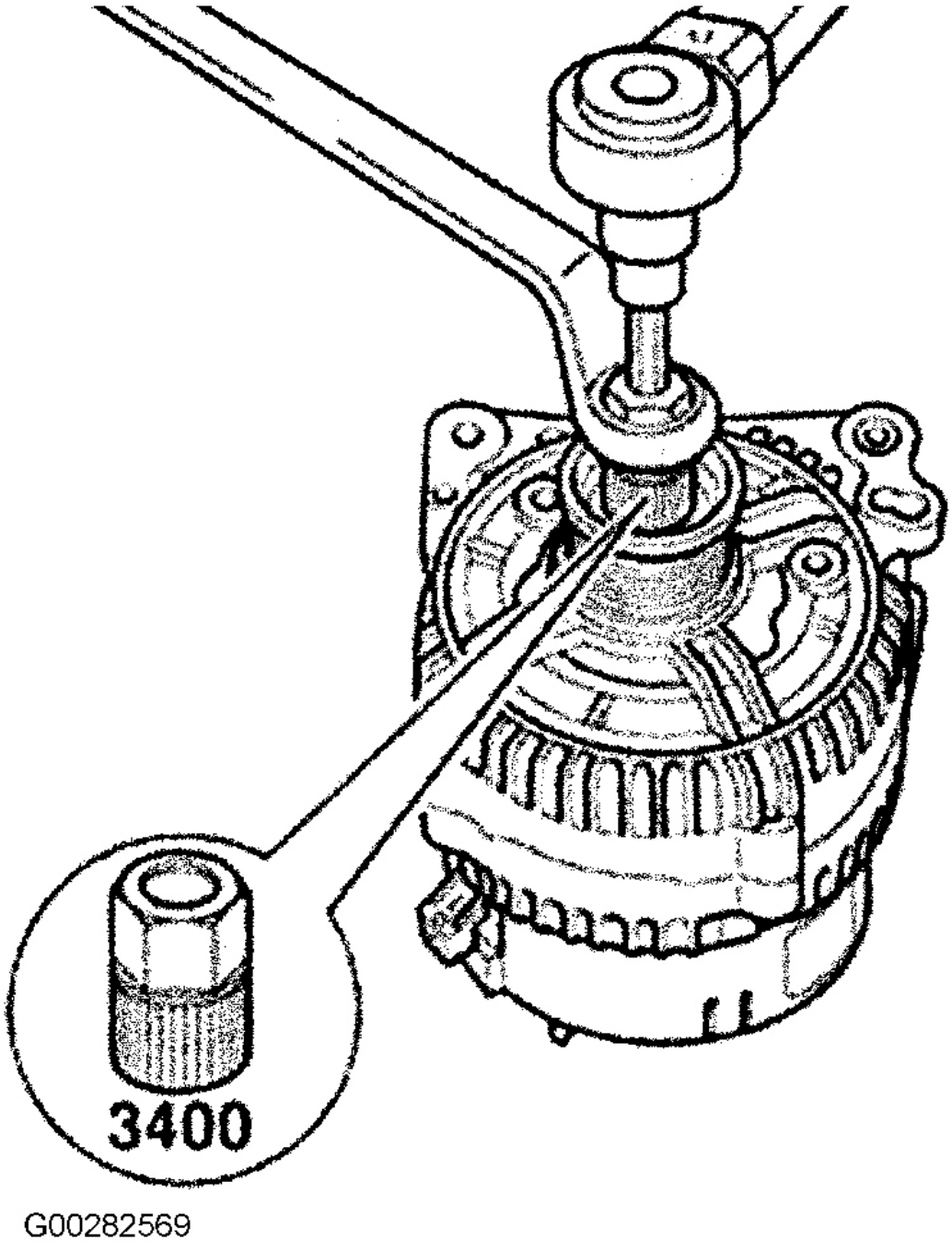


Fig. 34: Checking Or Removing Freewheeling Clutch W/Pulley
Courtesy of VOLKSWAGEN UNITED STATES, INC.

4. Turn ignition off. Attach SUN VAT 40 ammeter, or equivalent, black lead to battery negative terminal.

Attach SUN VAT 40 Red lead to battery positive terminal. Clamp SUN VAT 40 Green test lead to battery ground cable.

5. Turn on all electrical components. Start engine and maintain engine speed of 1500-2000 RPM. Observe SUN VAT 40 ammeter reading. If charging current is less than 75 amps, go to next step. If charging current is 75 amps or more, generator and voltage regulator are functioning properly, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete, if no DTCs reset.
6. Load test battery. If load test is okay, go to next step. If load test is not okay, replace battery. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Recheck charging current. Turn ignition off. Attach SUN VAT 40 ammeter black lead to battery negative terminal. Attach SUN VAT 40 Red lead to battery positive terminal. Clamp SUN VAT 40 Green test lead to battery ground cable. Turn off all electrical components. Start engine and maintain engine speed of 1500-2000 RPM. Observe SUN VAT 40 ammeter reading. If charging current is less than 75 amps, go to next step.
8. **NOTE: This testing procedure is for 2002-2004 generator w/serviceable voltage regulator/brushes only.**

   Disconnect battery. Remove voltage regulator w/generator brushes. See **Fig. 35** . Check generator brushes, see **Fig. 36** . Brushes should protrude minimum 0.200" (5 mm) from brush holder. If brushes are okay, go to next step. If brushes are not okay, replace faulty brushes. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

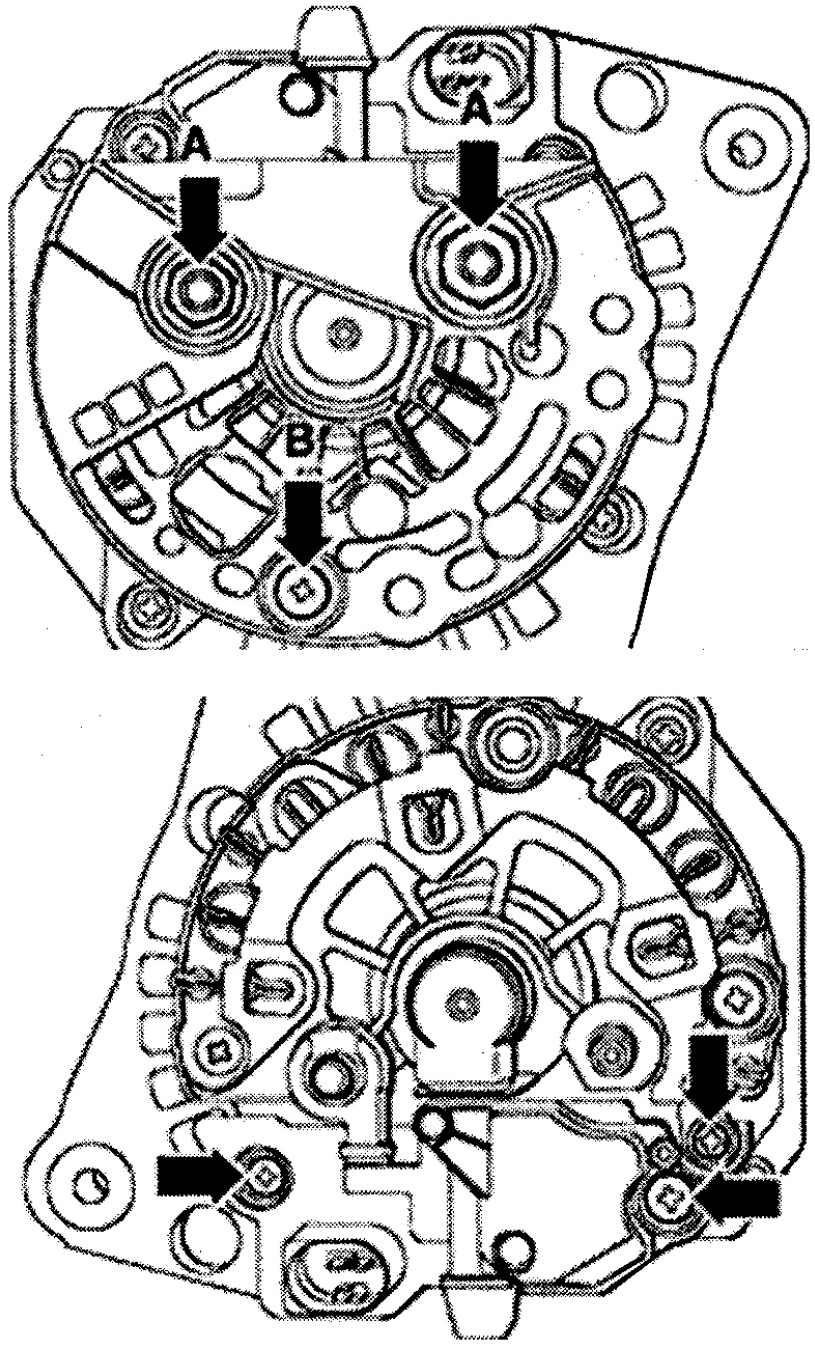


Fig. 35: Identifying Nuts & Bolts For Voltage Regulator & Generator Brushes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

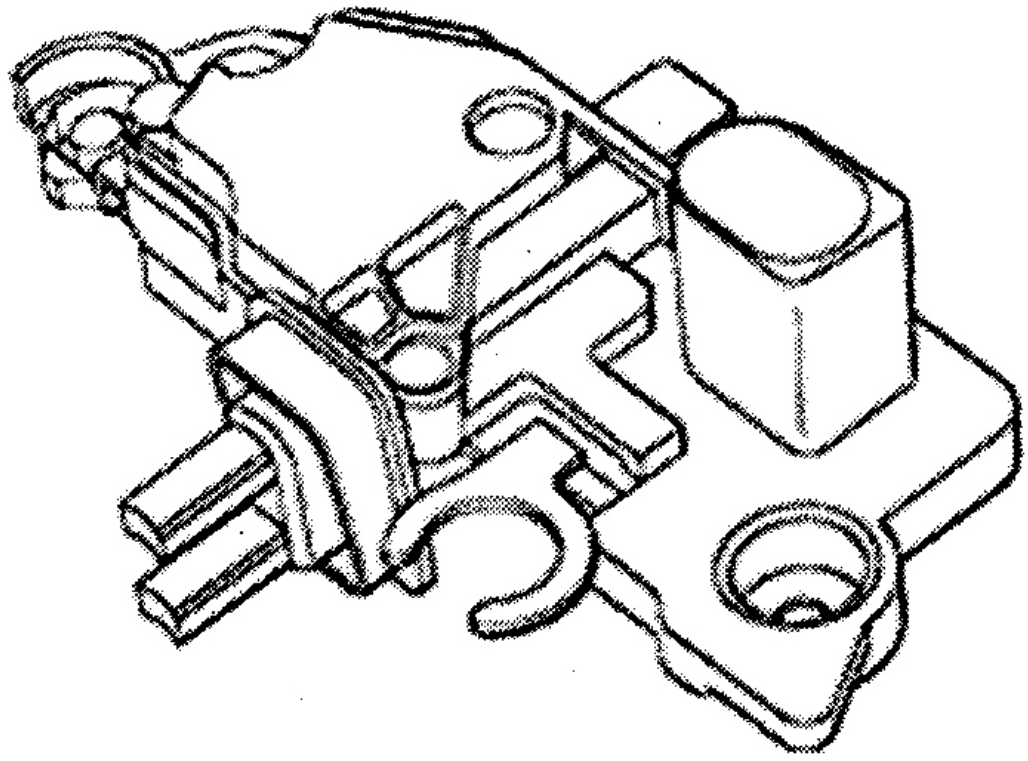


Fig. 36: Identifying Voltage Regulator & Generator Brushes
Courtesy of VOLKSWAGEN UNITED STATES, INC.

9. Replace faulty generator. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1537/17945 & DTC P1538/17946

Code Definition

DTC P1537/17945
Fuel Cut-Off Valve (N109) - Incorrect Function

DTC P1538/17946
Fuel Cut-Off Valve (N109) - Open Circuit/Short to Ground

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under

ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are engine stalls, engine will not start and/or lack of power.

Test Procedures

NOTE: It may be difficult to test Fuel Cut-Off Valve (N109) using Output Diagnostic Test Mode (DTM) since stalling is a symptom of both DTC P1537/17945 and P1538/17946.

1. Test Fuel Cut-Off Valve (N109) using DTM. See **OUTPUT DIAGNOSTIC TEST MODE** . Engine should stall. If engine stalled using DTM, continue using DTM with ignition on and engine off until DTM has tested all components. See **OUTPUT DIAGNOSTIC TEST MODE** .
2. Erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete if no DTC resets.
3. If engine did not stall when using DTM, remove, clean metal chips/dirt from Fuel Cut-Off Valve (N109) and reinstall Fuel Cut-Off Valve (N109). Repeat DTM, if engine does not stall, go to next step.
4. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector, see **CONNECTING VAG TEST BOX** (leave ECM disconnected).
5. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Measure resistance between terminal No. 8 at 10 pin harness connector and socket No. 120 at test box. See **Fig. 20** . Resistance should be less than 1.5 ohms. If resistance is as specified, go to next step. If resistance is not as specified, repair open in wiring between 10 pin Fuel Cut-Off Valve (N109) harness connector and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check wire at terminal No. 8 at 10 pin harness connector and socket No. 120 at test box for short circuit to B+ and ground. If wire is okay, go to next step. If wire has a short circuit, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Replace Fuel Cut-Off Valve (N109). After repairs, erase DTC memory. See **CLEARING**

DIAGNOSTIC TROUBLE CODES (FUNCTION 05) under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1550/17958: CHARGE PRESSURE - CONTROL DIFFERENCE

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

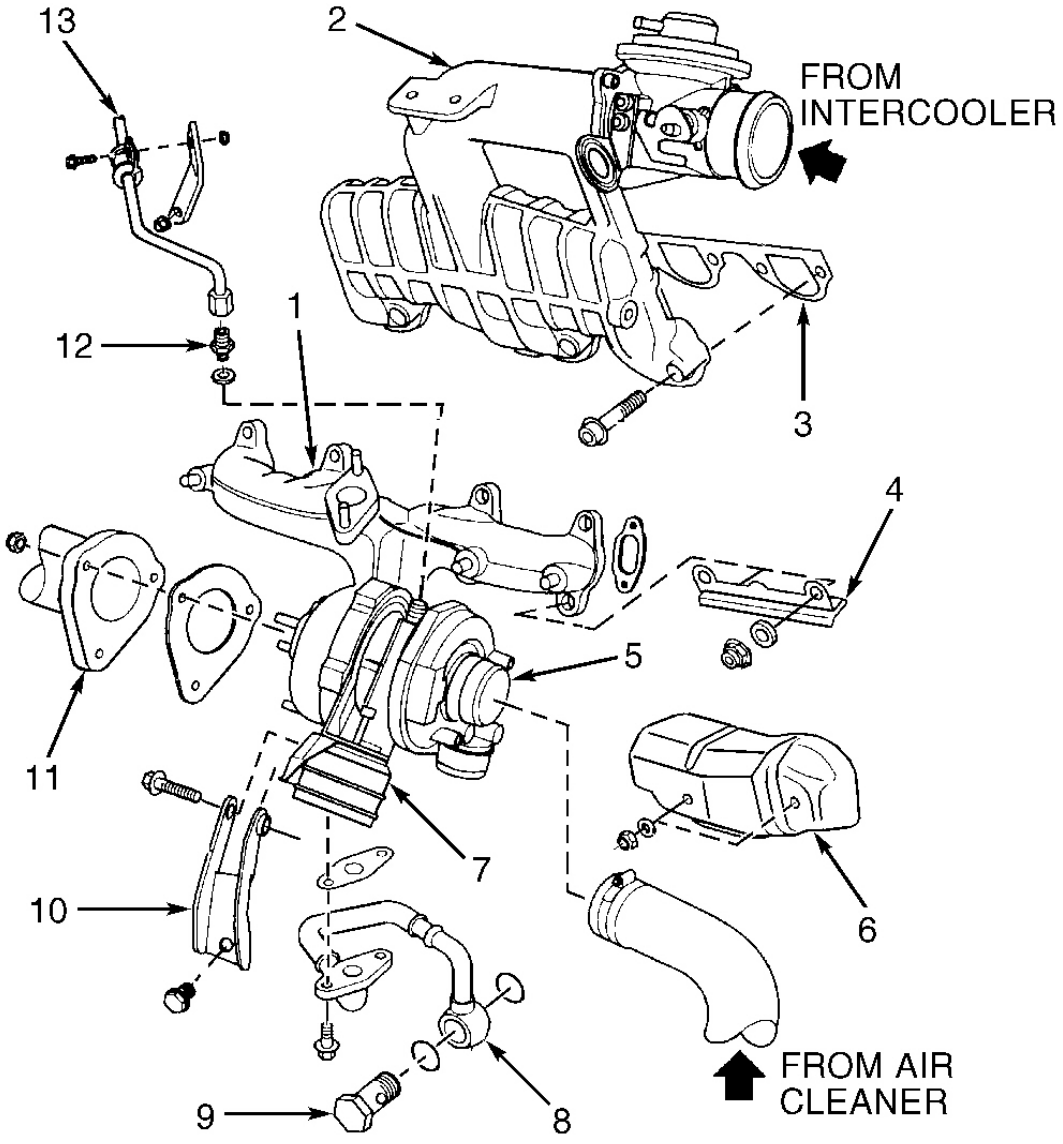
NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effect is a lack of power.

Test Procedures

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Connect Scan Tool VAG 1551/1552 or 5051/5052. See **Fig. 1** .
2. Start engine and idle. Using scan tool access "Display group 11". With a helper to operate scan tool from rear seat, accelerate vehicle in 3rd gear from about 1500 RPM to wide open throttle. Press VAG 1551 PRINT button at approximately 3000 RPM. Boost value should be 24.5-32.0 psi (1.7-2.2 bar).
3. If specified boost pressure is not attained, check turbo charger hoses/fittings and vacuum hoses for correct fit and routing. See **Fig. 31** , **Fig. 37** and **Fig. 38** . If hoses and fittings are okay, go to next step. If hoses or fittings are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If specified boost pressure is not attained, check Wastegate by-pass regulator valve. See **DTC P0245/16629, P0246/16630, P1546/17954 & P1549/17957** . Repeat turbocharger test. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

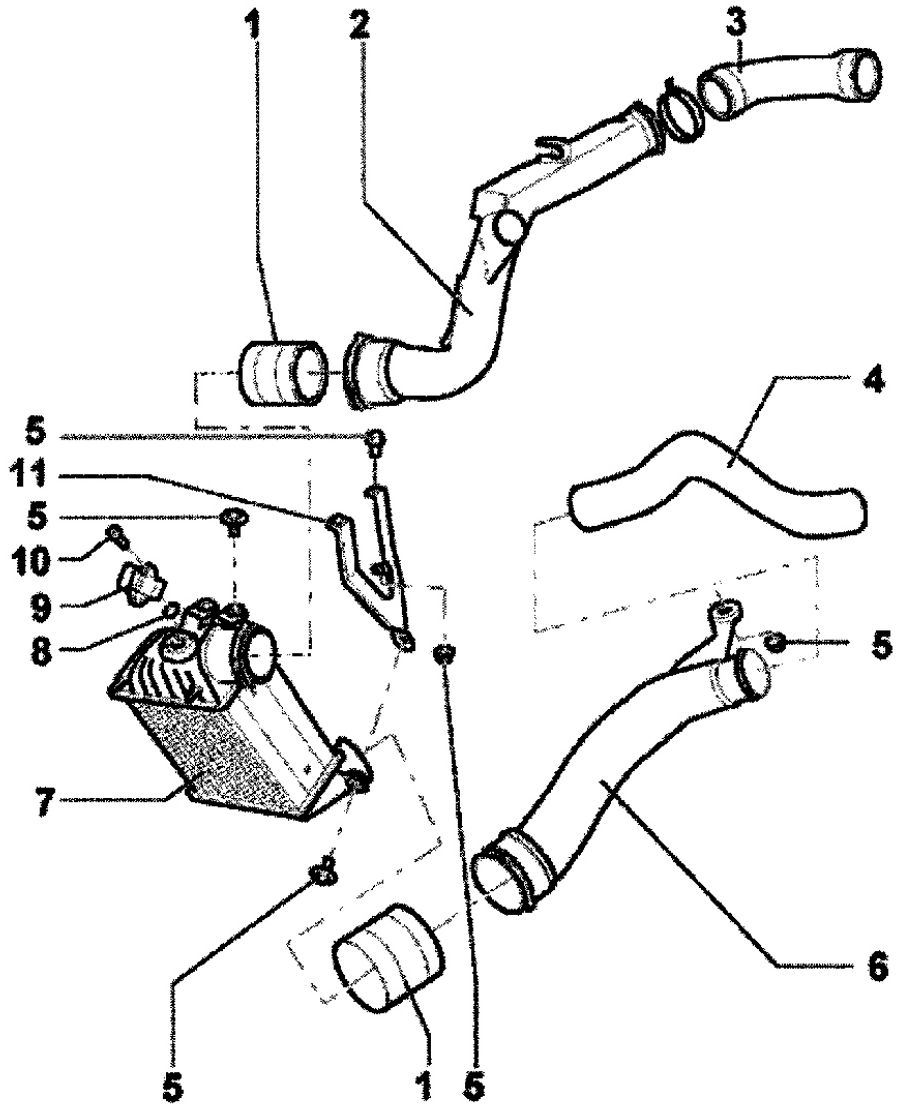


1. Exhaust Manifold
2. Intake Manifold
3. Intake Manifold Gasket
4. Exhaust Heat Shield Bracket
5. Turbocharger
6. Exhaust Heat Shield
7. Turbocharger Pressure Unit
8. Oil Return Line
9. Banjo Bolt
10. Bracket
11. Front Exhaust Pipe
12. Adapter
13. Oil Feed Line

G98G11417

Fig. 37: Identifying Turbocharger Components

Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. Connecting hose
2. Connecting pipe
3. Connecting hose
4. Connecting hose
5. 89 INCH lbs. (10 Nm)
6. Charge air pipe
7. Charge air cooler
8. O-ring
   - Replace if damaged
9. Manifold Absolute Pressure (MAP) sensor G71 with Intake Air Temperature (IAT) sensor G72
10. 44 INCH lbs. (5 Nm)
11. Bracket

G00282574

Fig. 38: Identifying Turbocharger Charge Air Cooling System Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1561/17969, DTC P1562/17970 & DTC P1563/17971

Code Definition

DTC P1561/17969
Injection Pump Quality Adjuster (N146) - Control Difference

DTC P1562/17970
Injection Pump Quality Adjuster (N146) - Upper Stop Value

DTC P1563/17971
Injection Pump Quality Adjuster (N146) - Lower Stop Value

NOTE: Injection Pump Quality Adjuster (N146) is an integral part of injection pump.

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are glow plug indicator light blinks, poor performance, black smoke and/or rough idle.

Test Procedures

1. Turn ignition off. Disconnect 10-pin harness connector. See **COMPONENT LOCATIONS** .
2. Measure resistance between terminals No. 5 and 6 at injection pump quality adjuster (component side). See **Fig. 19** . Resistance should be 0.5-2.5 ohms. If resistances are as specified, go to next step. If resistance is not as specified, replace injection pump. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM harness connector, see **CONNECTING VAG TEST BOX** (leave ECM disconnected).
4.

NOTE: Test box socket numbers correspond to ECM pin numbers.

Measure resistance between 10 pin harness connector terminals and test box sockets. See **INJECTION PUMP QUALITY ADJUSTER (N146) / TEST BOX SOCKET** table and **Fig. 20** .

INJECTION PUMP QUALITY ADJUSTER (N146) / TEST BOX SOCKET

Injection Pump Quality Adjuster (N146)	VAG Test Box Socket
5	1
5	2
6	116
6	121

5. Resistance should be less than 1.5 ohms for each reading. If resistance is as specified, go to next step. If any resistance is not as specified, repair open in wiring between 10 pin Injection Pump Quality Adjuster (N146) harness connector and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check terminals No. 5 and 6 for short to each other. Check terminals No. 5 and 6 for short to B+. Check terminals No. 5 and 6 for short to ground. If wiring is okay, go to next step. If wiring is not okay, repair short circuit(s) as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. If resistances are as specified and all wiring is okay, replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1569/17977 & VAG DTC 00671

Code Definition

DTC P1569/17977
Cruise Control Switch (E45) - Implausible Signal

VAG DTC 00671
Cruise Control Switch (E45) - Undefined Switch Position (DTC 00671 is displayed in VW factory scan tool format only.)

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM

are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

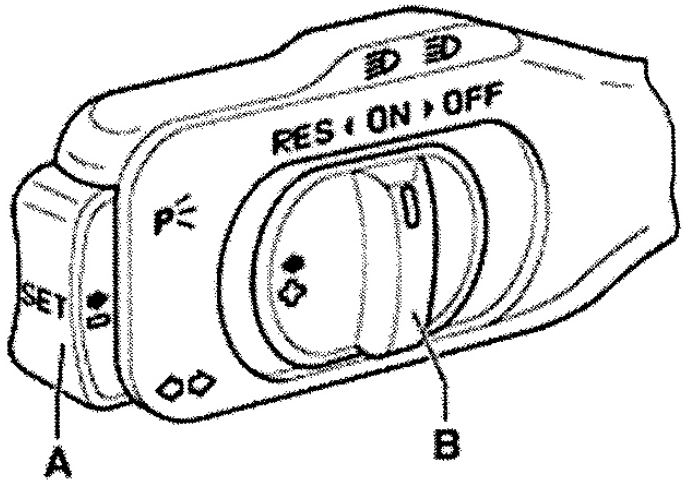
Possible effects are no cruise control.

Test Procedures

1. Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.
2. Check cruise control system. Turn ignition on, engine off. Connect scan tool, see **Fig. 1** . Press keys "0" and "1" for address word "Engine Electronics". If "00SG" is present in top line of scan tool display, cruise control is not activated. Activate cruise control, see, **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
3. If "G00SG" is present in top line of scan tool display, continue with testing. Press "right arrow" key, press keys "0" and "8" for "Read measured value block" and enter by pressing "Q" key. Press keys "0", "0" and "6" for display group "6" and enter by pressing "Q" key. "Display field 4" should read 0. If "Display field 4" reads 255, go to next step. If "Display field 4" reads 0, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete if no DTCs reset.
4. **NOTE: In vehicles with automatic transmissions (A/T). ECM (J248) does not supply voltage to Cruise Control Switch (CCS) (E45) until 20 MPH (32 KM/H) is exceeded.**

   Check CCS (E45). Start engine and let engine idle. Vehicles with (A/T) should be test driven to a minimum of 25 MPH (40 KM/H) in 2nd gear or higher. It is not necessary to test drive vehicles with manual transmissions (M/T).
5. **NOTE: All following readings in this step are in display field 3. See Fig. 39 .**

   Set parking brake. Turn ignition key into on position, (engine off). For A/T, select 2nd gear or higher. For M/T, select neutral. Check CCS (E45) test positions, moving down test requirement table. See **Fig. 39** . If any reading in display field 3 is not okay, go to next step. If all readings are okay, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete if no DTCs reset.



Checking requirements	Display zone 3
Switch B engaged at "OFF"	000000
Switch B at "OFF" before switch point	000001
Switch B at "ON"	000011
Switch B at "RES"	001011
Switch A pressed	000111
Brake pedal depressed	010011
Clutch pedal depressed	100011

G00282567

Fig. 39: Identifying Cruise Control Switch Test Positions & Test Requirements Table
Courtesy of VOLKSWAGEN UNITED STATES, INC.

6. Turn ignition off. Disconnect Engine Control Module (ECM) harness connector. Connect VAG 1598/31 test box to ECM harness connector (leave ECM disconnected). See **CONNECTING VAG TEST BOX** .
7. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Check wring for open circuits between CCS (E45) terminals and ECM (J248). See appropriate WIRING DIAGRAM under CRUISE CONTROL in SYSTEM WIRING DIAGRAMS. Resistance should be less

than 1.5 ohms for each reading. If resistance is as specified, go to next step. If resistance is not as specified, repair open and/or short circuit in wiring between CCS (E45) and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

8. Check wring for short circuit between CCS (E45) terminals and ECM (J248). See appropriate WIRING DIAGRAM under CRUISE CONTROL in SYSTEM WIRING DIAGRAMS. If circuits are not okay, go to next step. If circuits are okay, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete if no DTCs reset.
9. Repair short circuit(s) in wiring between CCS (E45) and ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1570/17978: ECM (J248) - BLOCKED

CAUTION: When replacing ECM (J248). It is necessary to adapt ECM to immobilizer. No information is available for VW.

CAUTION: Manufacturers states that scan tools VAS 5051 and VAS 5052 MUST be programmed with correct Importer/Dealer number as well as correct time when adapt ECM to immobilizer from model year 2002 on (Generation III immobilizer).

NOTE: Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Follow scan tool manufacturer instructions for adapting ECM to immobilizer.

DTC P1600/18008, DTC P1601/18009 & VAG DTC 00668

Code Definition

DTC P1600/18008
ECM Voltage Supply Terminal 15 - Voltage To Low

DTC P1601/18009
Power Supply Relay Terminal 30 (B +) - Relay Sticking (Intermittent)

VAG DTC 00668

NOTE: DTC 00668 is displayed in VW factory scan tool format only.

Voltage Terminal 30 - Implausible Signal

NOTE: **For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .**

NOTE: **Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.**

Possible Effects

Possible effects are various engine performance problems or engine will not start.

Test Requirements

Ensure battery voltage is at least 11.5 volts, A/C is off, and all accessories are off.

Test Procedures

Check ECM ground and voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** .

DTC P1609/18017: CRASH SWITCH - AIR BAG

Airbag has been deployed. Check Air Bag Control Module for DTCs. See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** . Repair as necessary. See appropriate AIRBAG article under RESTRAINTS.

DTC P1612/18020 & VAG DTC 01044

Code Definition

DTC P1612/18020
ECM (J248) - Incorrectly Coded

VAG DTC 01044

NOTE: **DTC 01044 is displayed in VW factory scan tool format only.**

ECM (J248) - Incorrectly Coded (No Display)

NOTE: **For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .**

NOTE: **Before replacing any component, ensure all connectors at component and ECM**

are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effect is glow plug indictor blinks.

Test Procedures

After ECM Code has been entered it is activated by turning ignition on and off. To code ECM, see **ENGINE CONTROL MODULE (J248) CODING** .

DTC P1616/18024 & DTC P1617/18025

Code Definition

DTC P1616/18024
Glow Plug Indicator Lamp (K29) - Short To B+

DTC P1617/18025
Glow Plug Indicator Lamp (K29) - Open Circuit/Short To Ground

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Possible Effects

Possible effects are indicator light not working or on continuously.

Test Procedures

1. Check glow plug indicator lamp using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** . Glow plug indicator lamp should flash. If glow plug indicator lamp does not flash, go to next step. If glow plug indicator lamp flashes, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no DTC resets, test is complete.
2. Check bulb and wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in

SYSTEM WIRING DIAGRAMS. Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1626/18034, DTC P1648/18056, DTC P1649/18057, DTC P1682/18090, DTC P1851/18259 & DTC P1854/18262

Code Definition

DTC P1626/18034
Drive Train CAN-Bus - Implausible Signal From Transmission Control Module (J217)

DTC P1648/18056
Drive Train CAN-Bus - System Component Inoperative

DTC P1649/18057
Drive Train CAN-Bus - Implausible Signal From ABS Control Module (J104)

DTC P1682/18090
Drive Train CAN-Bus - Implausible Signal From ABS Control Module (J104)

DTC P1851/18259
Drive Train CAN-Bus - Implausible Signal From ABS Control Module (J104)

DTC P1854/18262
Drive Train CAN-Bus - Inoperative

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

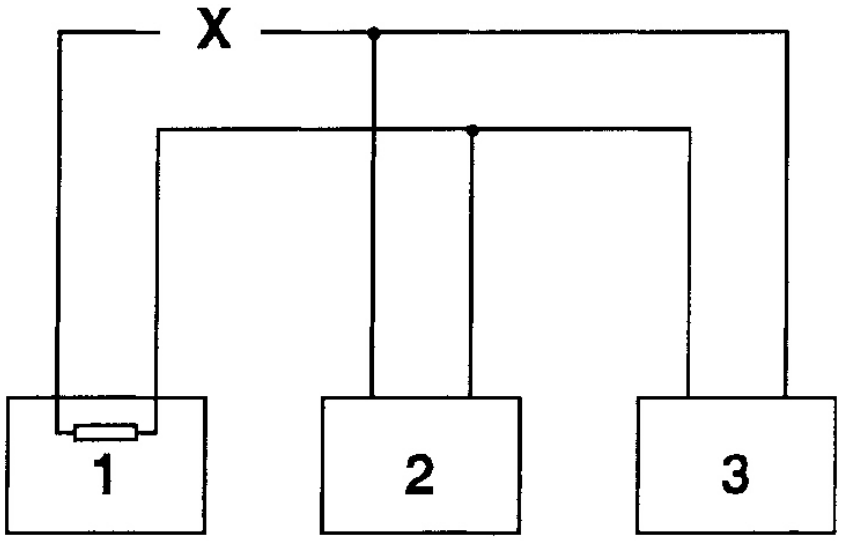
Possible Effects

Possible effects are various engine/A/T performance problems. No electronic ABS control.

Test Procedures (With A/T)

1. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM. See **CONNECTING VAG TEST BOX** (leave ECM harness connectors disconnected).

2. Measure resistance between test box socket No. 6 and test box socket No. 7. Resistance should be 60 to 72 ohms. If resistance is okay go to next step. If resistance is not okay, replace faulty ECM (J248). After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check wiring for Drive Train CAN-Bus. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE and COMPUTER DATA LINES in SYSTEM WIRING DIAGRAMS. Also see **Fig. 40** -**Fig. 42** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Check ABS Control Module (J104) and Automatic Transmission Control Module using Automatic Test Sequence. See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** . Repair or replace as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

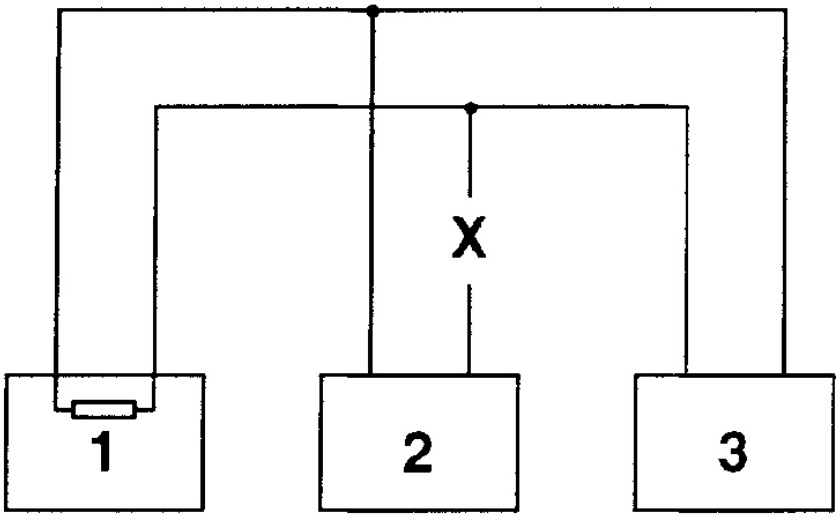


Example 1:

Control module	DTCs stored in DTC memories:
1	◆ Missing signal from control module 2 ◆ Missing signal from control module 3
2	◆ Missing signal from control module 1
3	◆ Missing signal from control module 1

G00077136

Fig. 40: Example 1: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.

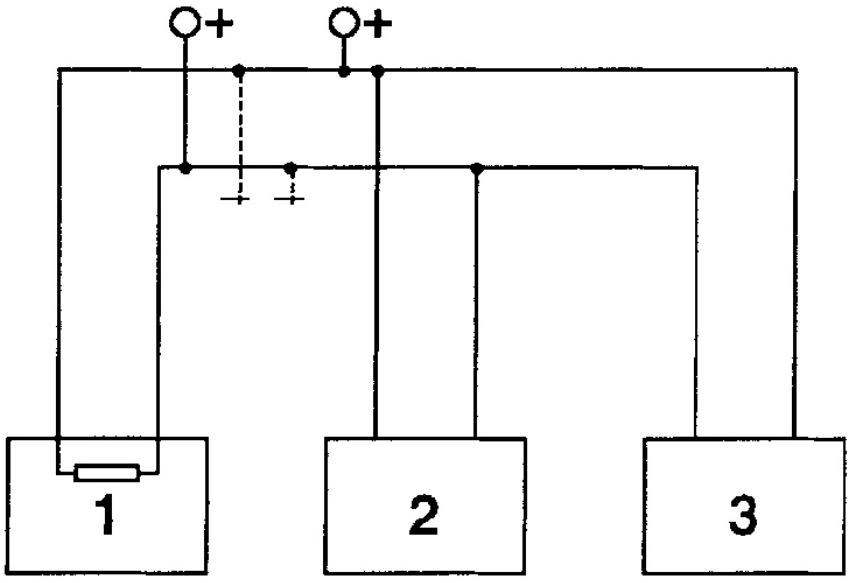


Example 2:

Control module	DTCs stored in DTC memories:
1	◆ Missing signal from control module 2
2	◆ Missing signal from control module 1 ◆ Missing signal from control module 3
3	◆ Missing signal from control module 2

G00077140

Fig. 41: Example 2: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.



Example 3:

Control module	DTCs stored in DTC memories:
1	◆ Powertrain CAN-bus faulty
2	◆ Powertrain CAN-bus faulty
3	◆ Powertrain CAN-bus faulty

G00077144

Fig. 42: Example 3: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.

Test Procedures (ABS)

1. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM. See **CONNECTING VAG TEST BOX** . Leave ECM harness connectors disconnected.
2. Measure resistance between test box socket No. 6 and test box socket No. 7. Resistance should be 60 to 72 ohms. If resistance is okay go to next step. If resistance is not okay, replace faulty ECM (J248). After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure.

See **TEST DRIVE RELEARN PROCEDURE** .

3. Check wiring for Drive Train CAN-Bus. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE and COMPUTER DATA LINES in SYSTEM WIRING DIAGRAMS. Also see **Fig. 40** -**Fig. 42** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Check ABS Control Module (J104) using Automatic Test Sequence. See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** . Repair or replace as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1636/18044, DTC P1650/18058 & DTC P3000/19456

Code Definition

DTC P1636/18044
Drive Train CAN-Bus - No Signal From Airbag Control Module (J234)

DTC P1650/18058
Drive Train CAN-Bus - No Signal From CAN Bus Interface (J533)

DTC P3000/19456
Drive Train CAN-Bus - No Signal From CAN Bus Interface (J533) - Glow Plug Warning Lamp (K29)

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Test Procedures

1. Turn ignition off. Disconnect ECM harness connector. Connect VAG 1598/31 test box to ECM. See **CONNECTING VAG TEST BOX** (leave ECM harness connectors disconnected).
2. Measure resistance between test box socket No. 6 and test box socket No. 7. Resistance should be 60 to 72 ohms. If resistance is okay go to next step. If resistance is not okay, replace faulty ECM (J248). After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

3. Check wiring for Drive Train CAN-Bus. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE and COMPUTER DATA LINES in SYSTEM WIRING DIAGRAMS. Also see **Fig. 40** -**Fig. 42** .
4. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1642/18050: DRIVE TRAIN CAN-BUS - MALFUNCTION IN AIRBAG SYSTEM

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Test Procedures

Check Airbag Control Module (J234) for DTCs . See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** . Repair or replace as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1653/18061: DRIVE TRAIN CAN-BUS - MALFUNCTION IN ABS SYSTEM

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Test Procedures

Check ABS Control Module (J234) for DTCs. See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** . Repair or replace as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1654/18062: DRIVE TRAIN CAN-BUS - MALFUNCTION IN COMBI-INSTRUMENT CLUSTER - OIL LEVEL/TEMPERATURE SENDER DEFECTIVE

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

Test Procedures

Check Combi-Instrument Cluster for DTCs . See **AUTOMATIC TEST SEQUENCE (FUNCTION 00)** . Repair or replace as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

P1657/18065: AIR CONDITIONER INPUT/OUTPUT - SHORT TO B +

1. Check A/C Compressor Interruption using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** . When running engine at idle, Output Diagnostic Test Mode activation should cycle A/C clutch at approximately 5 second intervals. If A/C clutch does NOT cycle at approximately 5 second intervals, go to next step. If A/C clutch cycles at approximately 5 second intervals, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no DTC resets, test is complete.
2. Check and repair wiring as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P3003/19459 & VAG DTC 01193

Code Definition

DTC P3003/19459
Pre-Heating Coolant/Low Heat Output Relay (J359) - Short To B+

VAG DTC 01193

NOTE: DTC 01193is displayed in VW factory scan tool format only.

Pre-Heating Coolant/Low Heat Output Relay (J359) - Short To B+

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

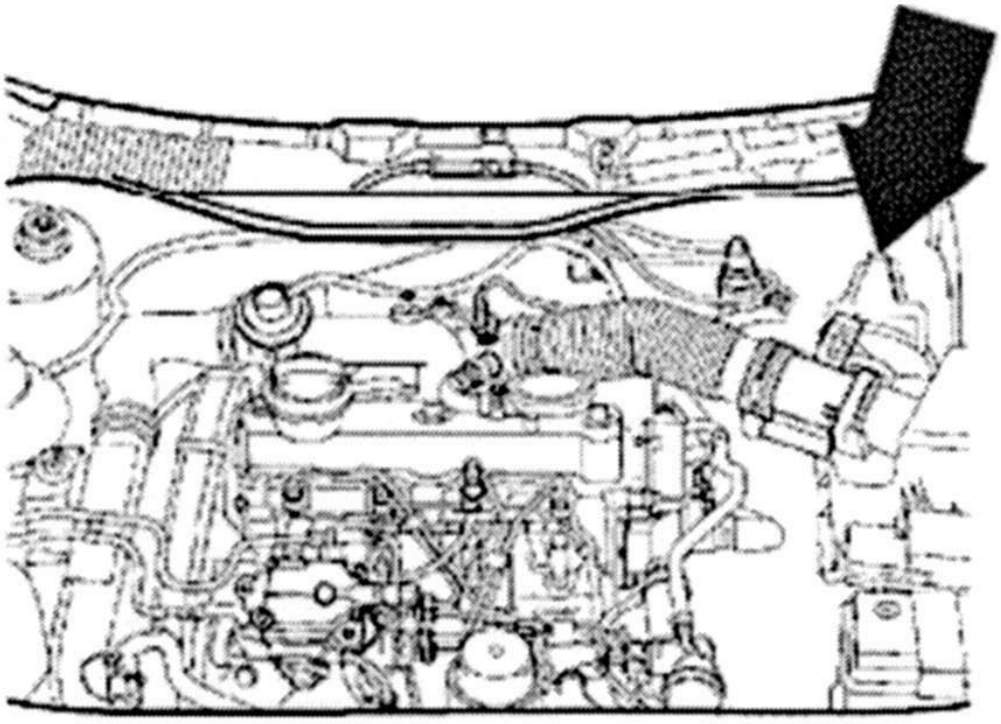
Possible Effects

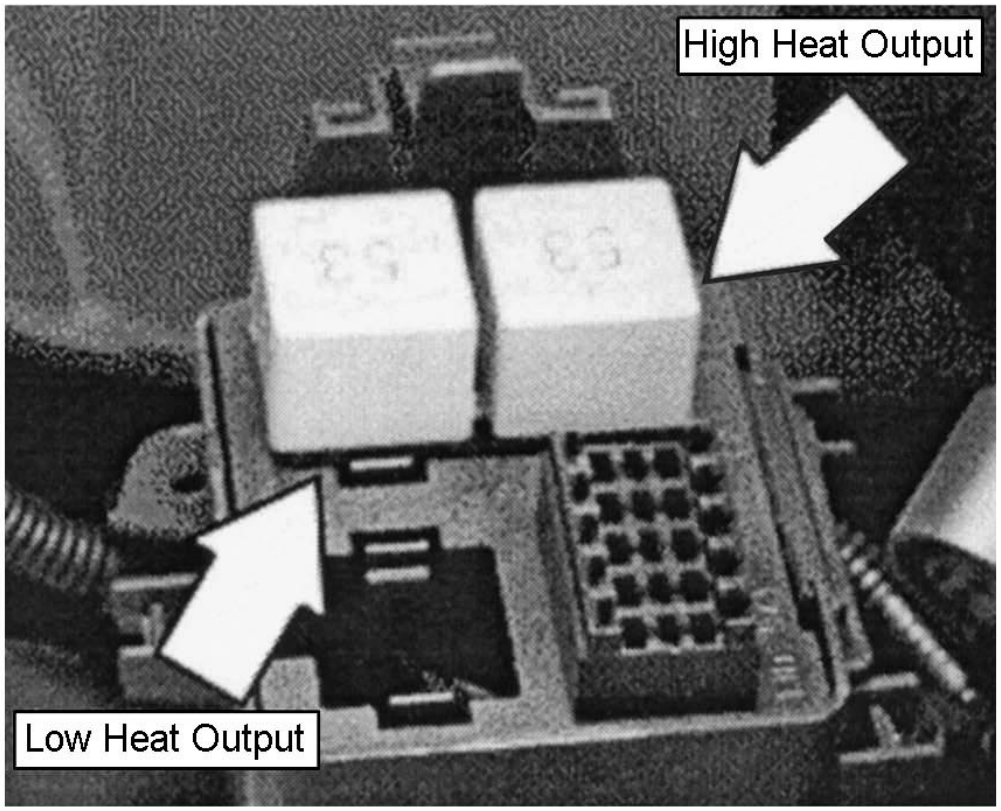
Possible effects are engine coolant pre heat inoperative.

Test Procedures

NOTE: Production control number for both high and low heat relays are 53.

1. Check pre-heating coolant/heat output relay using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** and **Fig. 43** .
2. Relay should click. If relay does not click, go to next step. If relay clicks, turn ignition off. Check relay connection at relay socket. Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete, if no DTCs reset.
3. Check wiring according to wiring diagram. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .





G00282573

Fig. 43: Locating Coolant Pre-Heating Relays
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P3005/19461 & VAG DTC 01194

Code Definition

DTC P3005/19461
Pre-Heating Coolant/High Heat Output Relay (J360) - Short To B+

VAG DTC 01194

NOTE: DTC 01194 is displayed in VW factory scan tool format only.

Pre-Heating Coolant/High Heat Output Relay (J360) - Short To B+

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Possible Effects

Possible effects are engine coolant pre heat inoperative.

Test Procedures

NOTE: Production control number for both high and low heat relays are 53.

1. Check pre-heating coolant/heat output relay using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** and **Fig. 43** .
2. Relay should click. If relay does not click, go to next step. If relay clicks, turn ignition off. Check relay connection at relay socket. Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is

complete, if no DTCs reset.

3. Check wiring according to wiring diagram. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Repair as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P3104/19560, DTC P3105/19561 & VAG DTC 01282

Code Definition

DTC P3104/19560
Change-Over Valve For Intake Manifold Flap (N239) - Short Circuit To B +

DTC P3105/19561
Change-Over Valve For Intake Manifold Flap (N239) - Open Circuit/Short Circuit To Ground

VAG DTC 01282

NOTE: DTC 01282 is displayed in VW factory scan tool format only.

Change-Over Valve For Intake Manifold Flap (N239) - Open Circuit/Short Circuit To Ground

NOTE: For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, see COMPONENT LOCATIONS .

NOTE: Before replacing any component, ensure all connectors at component and ECM are clean and tight. After making any repairs, disconnect ECM harness connector for 10 seconds, connect ECM harness connector and retest system. It is necessary to generate an ECM readiness code if ECM memory is cleared, battery voltage is disconnected or ECM is disconnected.

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Possible Effects

Possible effects are abrupt engine stop.

NOTE: On 1.9L Turbo Diesel models, intake manifold change-over valve and vacuum actuated flap are on throttle body and are used to reduce stop jolt when engine is turned off.

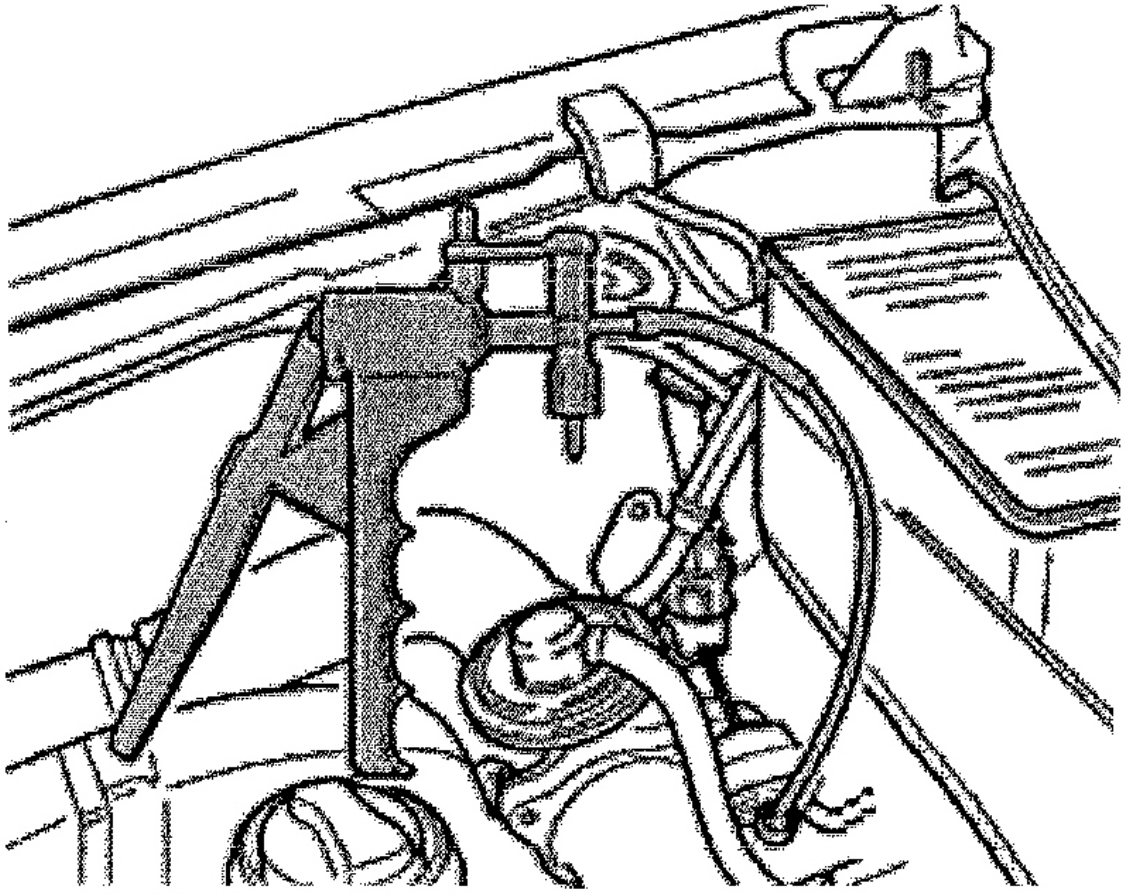
Test Procedures

NOTE: When voltage supply to ECM is interrupted, ECM looses all "learned" and/or "basic" values. Serious driveability problems may occur depending on vehicle mileage. A relearn procedure must be performed, see TEST DRIVE RELEARN PROCEDURE .

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Start engine and idle. Using a second technician, check position of linkage on vacuum actuated flap located in throttle body.
2. Turn engine off. Observe vacuum actuated flap linkage. With engine off, vacuum actuated flap should close and reopen after approximately 3 seconds. If vacuum actuated flap functions properly, intake manifold change-over system is okay. If vacuum actuated flap does not operate properly, go to next step.
3. Manually check vacuum actuated flap for freedom of movement. Using a vacuum pump, check vacuum actuated flap operation. See **Fig. 44** . If vacuum actuated flap operates properly, go to next step. If vacuum actuated flap does not operate properly, repair or replace as necessary. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Disconnect change-over valve harness connector. See **COMPONENT LOCATIONS** . Using a DVOM, check resistance of change-over valve. Resistance should be 25-40 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty change-over valve. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Using DVOM check voltage between change-over valve 2-pin harness connector terminals. See **Fig. 45** . Voltage should be 5-6 volts. Turn ignition off and observe DVOM. Voltage should change to 11-15 volts. After approximately 3 seconds, voltage should be zero volts. If voltage is not okay, go to next step. If voltage is okay, change-over system is okay, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF DIAGNOSTIC SYSTEM. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete, if no DTCs reset.
6. Connect Test Box (VAG 1598/31) with adapter cables from Test Kit (VAG 1594). See **CONNECTING VAG TEST BOX** .
7. **NOTE: Test box socket numbers correspond to ECM pin numbers.**

   Using DVOM, check for continuity between test box socket No. 81 and change-over valve 2-pin harness connector terminal No. 2. See **Fig. 45** . Using DVOM, check for continuity between test box socket No. 1 and change-over valve 2-pin harness connector terminal No. 1. Record resistance reading. Using DVOM, check for continuity between test box socket No. 2 and 2-pin harness connector terminal No. 1. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Check wires for short to each other, ground and short to battery voltage in wiring harness as necessary. If DVOM measurements are not okay. Repair wiring as necessary.
8. If DVOM measurements are okay, go to next step. Replace faulty ECM. After repairs, erase DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)** under SELF

DIAGNOSTIC SYSTEM. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083299

Fig. 44: Locating Intake Manifold Change-Over Vacuum Unit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

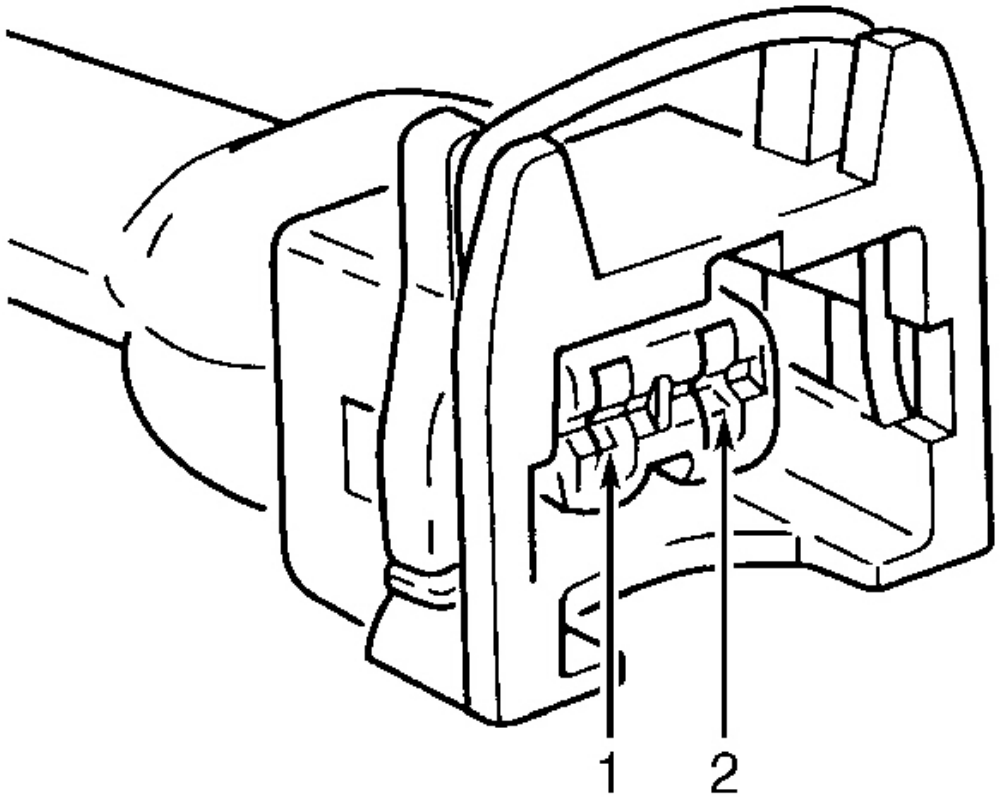


Fig. 45: Identifying Test Points On 2-pin Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Self-Diagnostics - 2.0L - Beetle, Golf & Jetta (Engine Codes AVH & AZG)

INTRODUCTION

NOTE: Before starting work on vehicle read SERVICE PRECAUTIONS .

NOTE: To properly diagnose vehicle, vehicle manufacturer recommends use of Scan Tool (VAG 1551, VAG 1552, VAS 5051 or VAS 5052) and Test Box (VAG 1598). Generic scan tools may not be able to perform all functions that are necessary e.g. Readiness Code, Idle Check and Automatic Test Sequence etc. All voltage tests should be performed with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless specifically stated differently in testing procedures. Ensure ignition switch is in OFF position when performing resistance tests.

Perform a visual inspection. See **VISUAL INSPECTION** . If no faults are found while performing visual inspection, proceed with SELF-DIAGNOSTICS. See **TESTING PROCEDURES** .

MODEL IDENTIFICATION

NOTE: Manufacture information for engine codes are inconsistent. There may be overlapping engine codes.

For engine and model identification, see **ENGINE CODES 2.0L (2001-03)** table.

ENGINE CODES 2.0L (2001-03)

Model	Engine Code
2001	
Beetle	AEG, AVH & AZG
Golf	AEG, AVH & AZG
Jetta	AEG, AVH & AZG
2002	
Beetle	AVH & AZG
Golf	AVH & AZG
Jetta	AVH & AZG
2003	
Beetle	AVH & AZG
Golf	AVH & AZG
Jetta	AVH & AZG

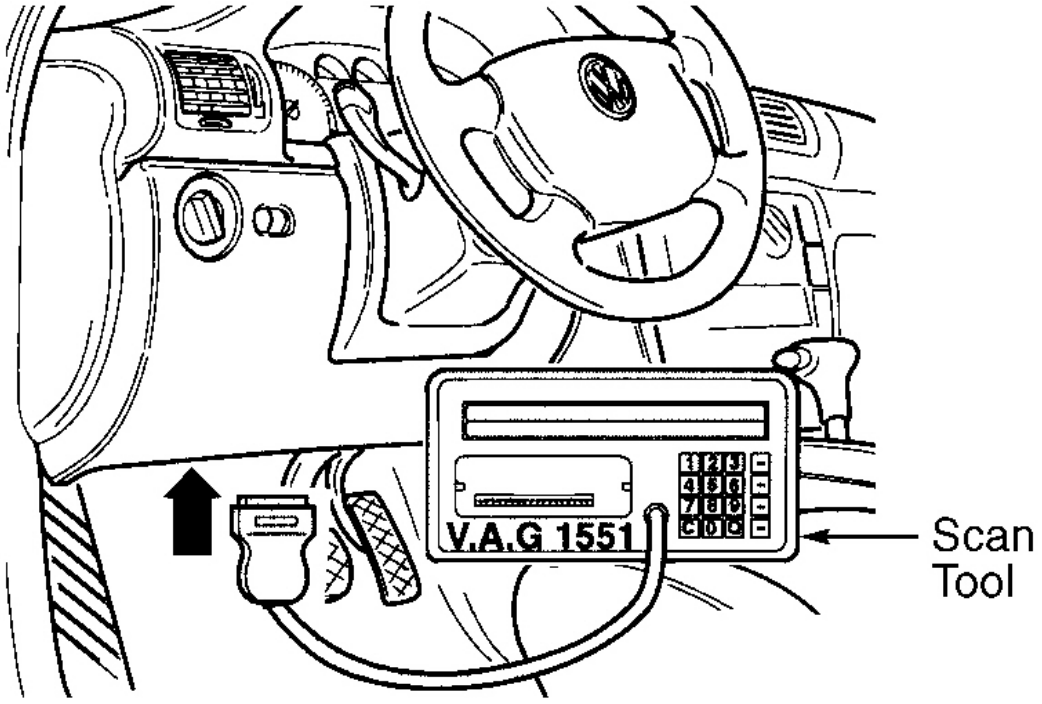
SELF DIAGNOSTIC SYSTEM

CAUTION: Before retrieving DTCs, read all information under title of DIAGNOSTIC TESTS. See DIAGNOSTIC TESTS .

NOTE: Read and record DTCs before starting diagnostic work (some testing procedures will set DTCs).

NOTE: When voltage supply to Engine Control Module (ECM) is interrupted, ECM retains Diagnostic Trouble Codes (DTCs), but loses all "learned" and "basic" values. Serious driveability problems may occur depending on vehicle mileage. After reconnecting ECM, it is necessary to perform relearn procedure. See TEST DRIVE RELEARN PROCEDURE .

ECM stores DTCs related to fuel injection, ignition and emissions systems. If a malfunction occurs, it will be indicated by Malfunction Indicator Light (MIL) in instrument cluster. See **MALFUNCTION INDICATOR LIGHT** . DTCs can be read using scan tool connected to Data Link Connector (DLC). DLC is located under left side of instrument panel. See **Fig. 1** .



G98A11411

Fig. 1: Locating Data Link Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

SERVICE PRECAUTIONS

WARNING: When working on vehicles ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Always use jack stands or hoist safeties when working on a raised vehicle.

WARNING: For safety during road test, it is advisable to have a helper operate tester from rear seat. If test and measuring instruments are operated from front passenger's seat and vehicle is involved in an accident, there is a possibility the person sitting in this seat may receive serious injuries when air bag is deployed.

WARNING: Exhaust System and related components operate at a very high temperature. Always allow system to cool or use proper protective clothing to prevent severe burns.

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

WARNING: Vehicles with an airbag are fitted with a crash/fuel shut-off. It reduces the risk of a vehicle burning in the event of a crash, fuel pump is switched off by the fuel pump relay. At the same time, this device improves the starting of the engine because as soon as the door is opened, the fuel pump is activated to build up pressure in the fuel system. Remove fuel pump fuse before opening fuel system. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

- Turn ignition off when connecting or disconnecting test equipment, unless specifically instructed not to do so in repair instructions.
- Turn ignition off before connecting or disconnecting ME-SFI control module (ECM), (J220) connectors.
- Perform all resistance and voltage tests with a Digital Volt-ohmmeter (DVOM) with minimum 10-megohm impedance, unless stated otherwise in test procedures.
- Ensure ignition switch is in OFF position when performing resistance tests.
- Remove fuel pump fuse before opening fuel system. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.
- Fuel hoses in engine compartment must only be secured by spring type clamps.
- When performing an ignition spark test, check one spark plug at a time and ensure spark plug is grounded.
- When performing compression test, remove fuse for fuel injectors and disconnect all 4-pin connectors from ignition coils. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in

ELECTRICAL.

ON-BOARD DIAGNOSTICS

Misfire

CAUTION: A Malfunction Indicator Light (MIL) flashing in equally timed increments during vehicle operation indicates malfunction(s) causing a misfire. Vehicle must not be driven at full power and must be diagnosed and repaired before catalytic converter damage occurs.

A malfunction that causes a misfire during vehicle operation causes MIL to flash in equally timed increments. This is a malfunction (e.g. misfire) that may cause catalytic converter damage. If MIL flashes in equally timed increments during vehicle operation, cause of malfunction must be determined. See **DTC IDENTIFICATION** table.

Hard Failures

Hard failures cause MIL to illuminate and remain on until problem is repaired. If MIL comes on and remains on during vehicle operation, cause of malfunction must be determined. See **DTC IDENTIFICATION** table. In addition EPC malfunctions are indicated by an EPC warning light and MIL in instrument cluster. See **Fig. 2** and **Fig. 3** under **MALFUNCTION INDICATOR LIGHT (K83)** . For most sensors, if a sensor fails, ECM will use a substitute value in its calculations to continue engine operation. In this condition, commonly known as limp-in or limp-home mode, the vehicle runs but driveability will not be optimum.

The Engine Speed (RPM) sensor (G28) is a speed and reference mark sensor. The engine will not start if there is no engine speed (RPM) signal. If the engine speed (RPM) signal fails when the engine is running, it will cause the engine to stall immediately.

Sporadic Malfunctions (Intermittent Failures)

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be e.g. a loose contact or a intermittently open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTC(s) will be erased from ECM memory. A warm-up phase is, engine started with coolant temperature below 122°F (50°C), switched off at above 162°F (72°C).

Sporadic malfunctions (intermittent failures) may cause Malfunction Indicator Light (MIL) to flicker or illuminate and go out after the intermittent fault goes away. DTC will be retained in ECM memory. Sporadic malfunctions (intermittent failures) may be caused by a sensor, connector or wiring related problems.

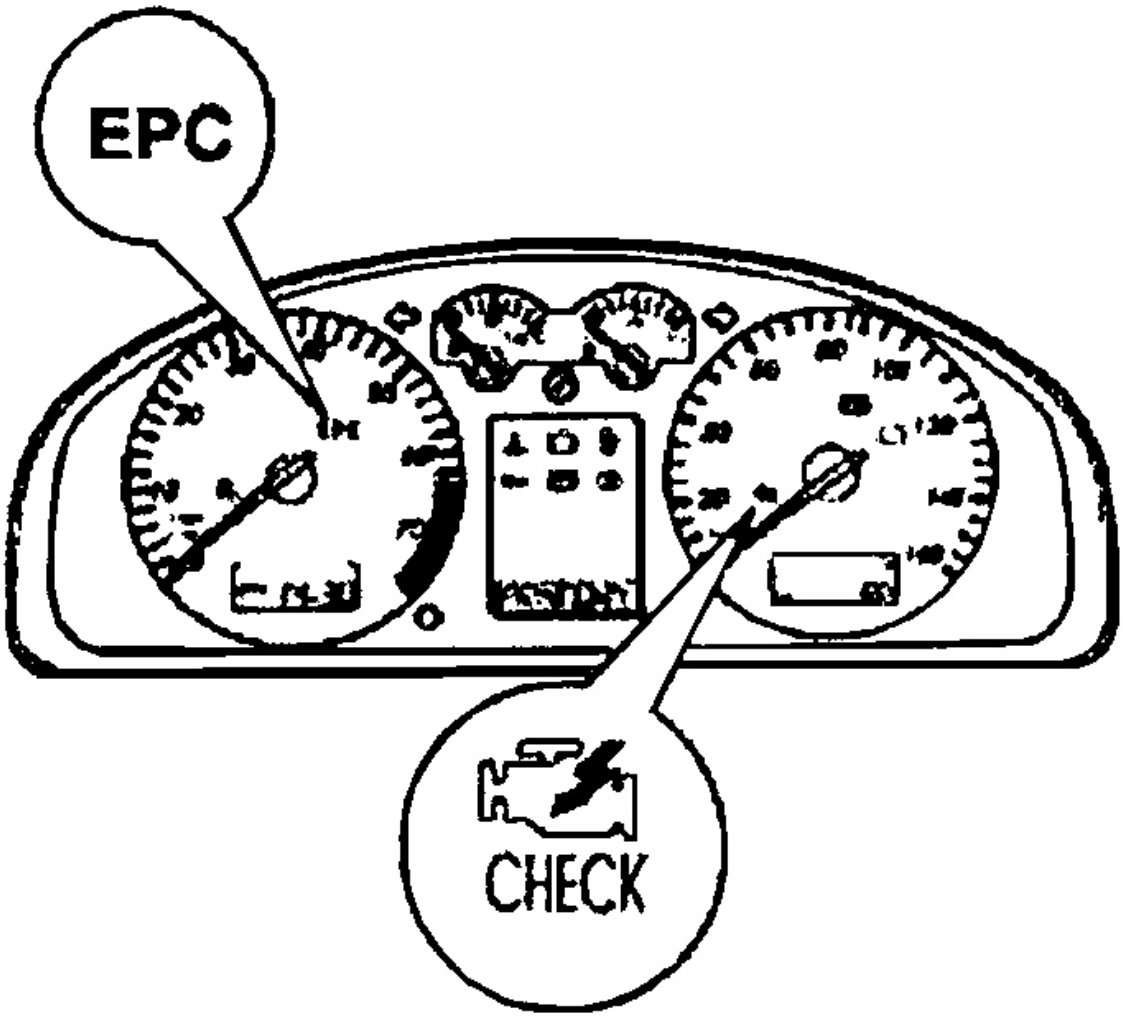
MALFUNCTION INDICATOR LIGHT (K83)

NOTE: **Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .**

All models are equipped with a Malfunction Indicator Light (MIL). MIL illuminates when a system failure has been detected and DTC has been stored in Engine Control Module (ECM) memory. For location of MIL, see **Fig. 2** and **Fig. 4** .

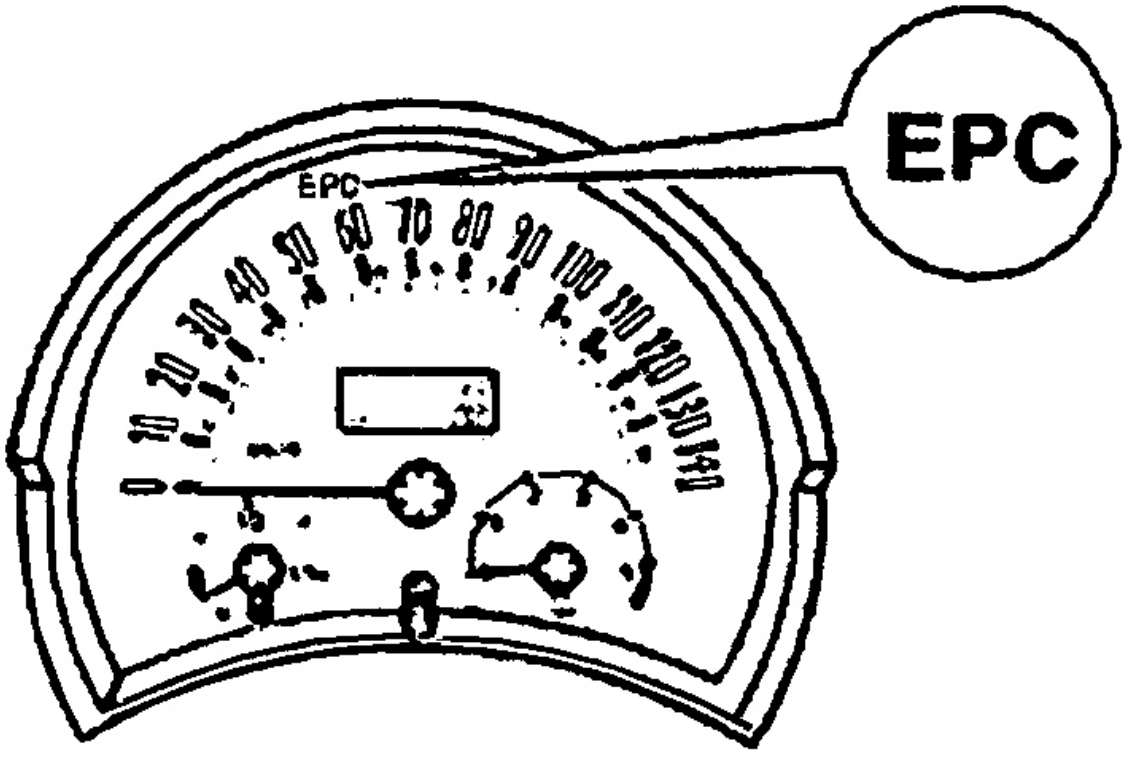
MIL and Electronic Power Control (EPC) warning light both illuminate when a system failure has been detected in the EPC system. DTC is also stored in ECM memory.

CAUTION: A Malfunction Indicator Light (MIL) flashing in equally timed increments during vehicle operation indicates malfunction(s) causing a misfire. Vehicle must not be driven at full power and must be diagnosed and repaired before catalytic converter damage occurs.



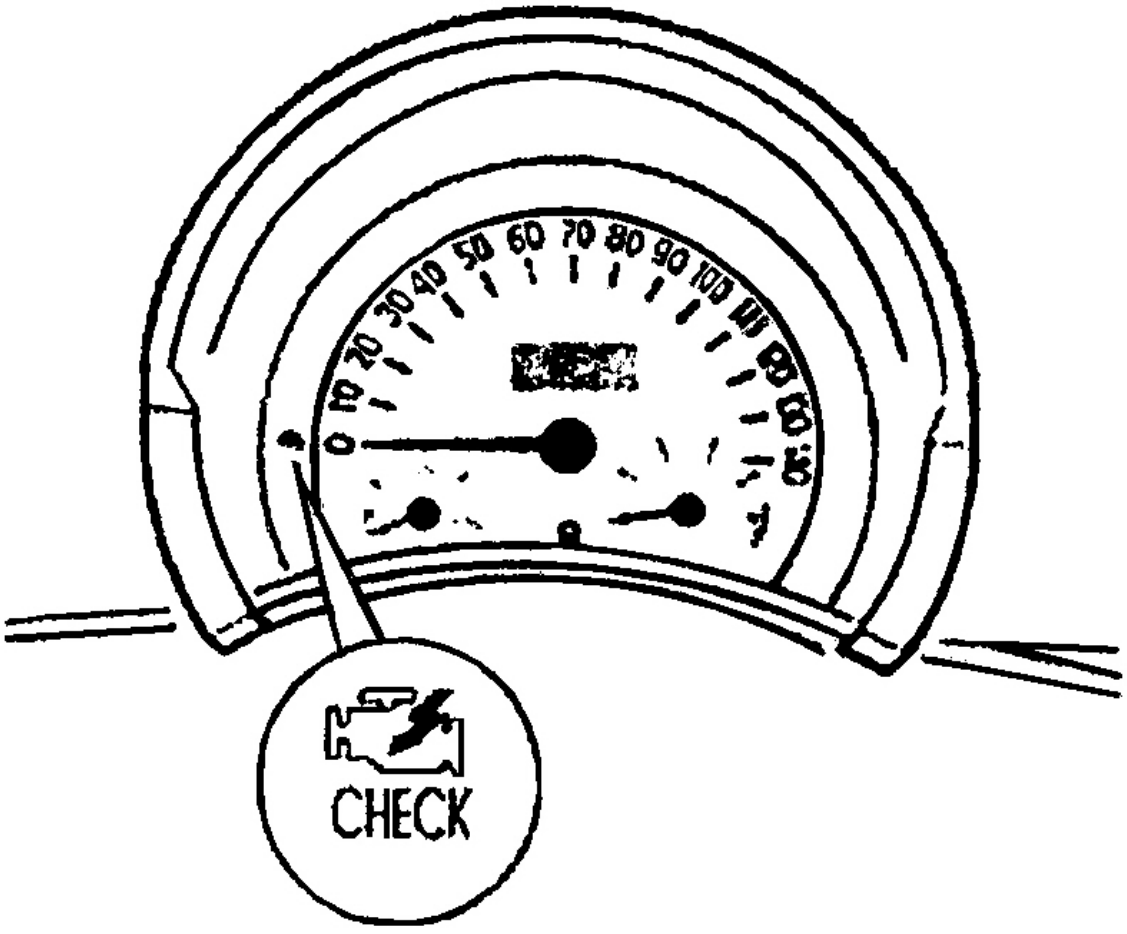
G00083384

Fig. 2: Locating Malfunction Indicator Light & Electronic Power Control Warning Light (Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083383

Fig. 3: Locating Electronic Power Control Warning Light (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083381

Fig. 4: Locating Malfunction Indicator Light (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

MALFUNCTION INDICATOR LIGHT CHECK

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Turn ignition on, with engine off. If MIL does not illuminate, check for codes. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster for MIL. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

If MIL is illuminated with engine running, turn engine off. Check for codes. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster MIL. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

ELECTRONIC POWER CONTROL WARNING LIGHT (K132)

NOTE: Electronic Power Control (EPC) is Volkswagen's name for their electronic throttle drive system. Also referred to as E-Gas System by Volkswagen.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Components that make up the EPC system are the ECM and EPC warning light. The Throttle Valve Drive (G186), Angle Sensor 1 for throttle valve drive (G187) and Angle Sensor 2 for throttle valve drive (G188) are an integral part of Throttle Valve Control Module (J338). The Accelerator Position Sensor 1 (G79) and Accelerator Position Sensor 2 (G185) are together in 1 unit and are located in accelerator pedal assembly.

MIL and EPC warning light both illuminate when a system failure has been detected in the EPC system. DTC is also stored in ECM memory. For location of EPC warning light, see **Fig. 2** and **Fig. 3** .

ELECTRONIC POWER CONTROL WARNING LIGHT CHECK

Turn ignition on, with engine off. If EPC does not illuminate, check for codes. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster for EPC. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

If EPC is illuminated with engine running, turn engine off. Check for codes. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster for EPC. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

TESTING PROCEDURES

Diagnosis of engine control system should be performed in the following order:

1. Perform a visual inspection. See **VISUAL INSPECTION** article. Ensure all engine systems not related to ECM are operating properly. Check for any Technical Service Bulletins (TSBs) that may apply. DO NOT proceed with testing unless all engine problems not related to ECM have been repaired.
2. **NOTE: Read and record DTCs before starting diagnostic work, (some testing procedures will set DTCs).**

   Start engine and check MIL. If MIL flashes, this indicates malfunctions that may cause catalytic converter damage (e.g. misfire). If MIL flashes or stays on, enter diagnostics and determine if DTCs are present. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If DTCs were displayed, determine whether codes are hard or sporadic malfunctions (intermittent codes). Hard codes will cause MIL to illuminate continuously while engine is running. See **ON-BOARD DIAGNOSTICS** .

3. For diagnosing hard codes, proceed to appropriate DTC test. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . When diagnosing sporadic malfunctions (intermittent codes), using Scan Tool VAG 1551/1552 or VAS 5051/5052 most sporadic malfunctions (intermittent codes) will display with /SP (sporadic malfunction) after code.
4. If MIL stays on, and no DTCs are present, or if MIL does not come on, check MIL. See **MALFUNCTION INDICATOR LIGHT CHECK** .
5. After necessary repairs are made, perform ECM test drive relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

VISUAL INSPECTION

Prior to retrieving DTCs, perform a comprehensive visual inspection of underhood components. Check ground connections located on intake manifold, ground cable between engine and vehicle body and that battery cables are clean and tight. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

Check vacuum hoses for breakage and blockage. Check electrical wiring and harness connectors for damage and corrosion. Repair as necessary. Ensure all engine systems not related to ECM are operating properly. Check for any Technical Service Bulletins (TSBs) that may apply. DO NOT proceed with testing unless all engine problems not related to ECM have been repaired. Go to step 2 under TESTING PROCEDURES.

AUTOMATIC TEST SEQUENCE (FUNCTION 00)

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like harness connector disconnected). Automatic Test Sequence is function 00 when using Scan Tool VAG 1551/1552 or VAS 5051/5052.

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for entering AUTOMATIC TEST SEQUENCE.

Scan Tool VAG 1551/1552 or VAS 5051/5052

1. Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . To enter Automatic Test Sequence, press "0" key 2 times for address word "Automatic test sequence" and enter by pressing "Q" key. VAG 1551/1552 or VAS 5051/5052 communicates with all control modules in CAN Data Bus. Any DTCs that are stored will be displayed or "No DTC recognized" will display for each control module one after another. Automatic test sequence has ended when, "VAG On Board Diagnostic HELP 1 - Rapid data transfer 2 - Flash code output" is displayed. Erase DTCs. See **CLEARING DIAGNOSTIC TROUBLE CODES** . Perform test drive. See **TEST DRIVE RELEARN PROCEDURE** . Go to next step.
2. If no DTCs are stored after test drive, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. If DTC(s) are stored in a control module in CAN Data Bus, see appropriate DTC table

and diagnostic procedure, (e.g. ABS DTC IDENTIFICATION table, under appropriate BRAKES/ANTI-LOCK/TRACTION CONTROL article, if ABS DTC is stored). Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform test drive. See **TEST DRIVE RELEARN PROCEDURE** .

RETRIEVING DIAGNOSTIC TROUBLE CODES (FUNCTION 02)

NOTE: Read and record DTCs before starting diagnostic work, some testing procedures will set DTCs. If no DTCs are stored, do not erase memory, erasing DTC memory will cause readiness code to be erased. If ignition is switched off between "Retrieving Diagnostic Trouble Codes" and "Clearing Diagnostic Trouble Codes" the DTC memory will not be erased, repeat "Retrieving Diagnostic Trouble Codes" procedure.

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like a harness connector disconnected). See AUTOMATIC TEST SEQUENCE .

NOTE: Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Generic scan tool may not be able to perform all test functions. If engine does not start, (this test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052) connect scan tool. Operate starter for approximately 6 seconds, do not switch ignition off. Turn on scan tool printer. Operate scan tool, according to scan tool display information. Check for DTCs.

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be a loose harness connector or an intermittently open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTCs will be erased from ECM memory. A warm-up phase is engine started with coolant temperature below 122°F (50°C), switched off at above 162°F (72°C).

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for reading DTCs. To identify DTCs, see **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . After performing DTC checks and repair work, malfunctions may be present in other control modules such as harness connector disconnected. DTC memories of all control modules must be checked and erased. See **AUTOMATIC TEST SEQUENCE** .

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Start engine and idle.
2. Using Scan Tool VAG 1551/1552 or VAS 5051/5052 start engine and press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "2" for "Check DTC memory" and enter by pressing "Q" key. If DTCs are present, record or print DTCs. Press keys "0" and "5" for function "Erase DTC memory" and enter by pressing "Q" key. Press right arrow key, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. To identify DTCs, see **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary. If no DTCs are present "No DTC recognized" will display. Press right arrow key, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.
3. After performing DTC checks and repair work, malfunctions may be present in other control modules such as harness connector disconnected.
4. DTC memories of all control modules must be checked and erased. This sequence when using Scan Tool VAG 1551/1552 or VAS 5051/5052. See **AUTOMATIC TEST SEQUENCE** .
5. If no DTCs are present or after clearing diagnostic trouble codes from all control modules, perform a long road test. Coolant temperature needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive, must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. After road test recheck all control modules for DTCs. If DTCs are present, repair as necessary. Clear codes. See **CLEARING DIAGNOSTIC TROUBLE CODES** . Verify repairs. Test is complete.

CLEARING DIAGNOSTIC TROUBLE CODES (FUNCTION 05)

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like e.g. harness connector disconnected). See AUTOMATIC TEST SEQUENCE .

NOTE: If ignition is switched off between "Retrieving Diagnostic Trouble Codes" and "Clearing Diagnostic Trouble Codes" the DTC memory will not be erased, repeat "Retrieving Diagnostic Trouble Codes" procedure.

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for clearing DTCs.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . DTCs must be read before being erased. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If using Scan Tool VAG 1551/1552 or VAS 5051/5052 start engine Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "5" for function "Erase DTC memory," and enter by pressing "Q" key. Press keys "0" and "6" for function "End Output", and enter by pressing "Q" key.

TEST DRIVE RELEARN PROCEDURE

NOTE: When voltage supply to ECM is interrupted or codes have been cleared, ECM loses all "learned" and/or "basic" values. Serious driveability problems may occur depending on vehicle mileage. A relearn procedure must be performed.

1. If ECM was disconnected during diagnostic procedure or codes have been cleared, go to next step. If ECM was not disconnected during diagnostic procedure and no codes are present. Perform a test drive. Recheck for codes (no relearn procedure is necessary).
2. Turn ignition off. Remove test equipment. Reconnect ECM connector. Reconnect all remaining (disconnected) electrical connectors/components. Go to next step.
3. **NOTE: Throttle Valve Control Module (J338) adapts to ECM (J220) automatically if ignition is switched on for 10 seconds or more without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.**

   Turn ignition on for a minimum of 10 seconds. Turn ignition off. Perform idle check. See **IDLE CHECK** . Perform a long road test. Coolant temperature needs to be greater than 176°F (80°C). Idle, partial throttle, full throttle and overdrive, all must be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. Read readiness code. Generate readiness code if necessary. See **READINESS CODE** .

IDLE CHECK

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, idle is tested in two ways, one after the other. First in "Idling test" - "Basic Setting" Display Group 1, then in "Basic Setting " - Display Group 56.

Generic Scan Tool

1. Before checking idle. Throttle valve must not be obstructed or lose. Ensure no exhaust leaks in between cylinder head and catalytic converter exist. Intake air temperature must be less than 140° F (60° C). Coolant temperature needs to be greater than 176° F (80° C). Battery voltage needs to be greater than 11.5 volts. All electrical consumers and A/C need to be switched off. Cruise control system must be in good working order. Vehicle in park or neutral, with parking brake set.
2. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Start engine and idle. Using scan tool check for DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If any DTCs are present, repair as necessary and clear codes. See **CLEARING DIAGNOSTIC TROUBLE CODES** . Continue running engine at idle speed.
3. Briefly increase engine RPM to 3500 and let idle for two minutes. Using scan tool, follow scan tool manufacturer instructions to check idle speed. See **IDLE SPECIFICATIONS** table.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Before checking idle. Throttle valve must not be obstructed or lose. There must be no exhaust leaks in between cylinder head and catalytic converter. Intake air temperature must be less than 140° F (60° C). Coolant temperature needs to be greater than 176° F (80° C). Battery voltage needs to be greater than 11.5 volts. All electrical consumers and A/C need to be switched off. Cruise control system must be in good working order. Vehicle in park or neutral, with parking brake set.
2. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Start engine and idle. Using scan tool check for DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If any DTCs are present, repair as necessary and clear codes. See **CLEARING DIAGNOSTIC TROUBLE CODES** . Continue running engine at idle speed.
3. Press keys "0" and "1" for "Engine Electronics", and enter by pressing "Q" key. Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press keys "0", "0" and "1" for display group "1" and enter by pressing "Q" key. Briefly increase engine RPM to 3500 and let idle for two minutes. If "Specified value" window of display field 4 does not read 1x111111. Repair as necessary. Repeat Idle Check. Go to step 1 .
4. Check idle speed. Press keys "0", "5" and "6" for display group 56 and enter by pressing "Q" key. Check actual idle speed in "Specified value" window of display field "1", check specified idle speed in "Specified value" window of display field "2". See **IDLE SPECIFICATIONS** . Press right arrow key. Press keys "0", and "6" for function "End Output" and enter by pressing "Q" key. If "Specified value" window of display field 1 is not okay. Repair as necessary. Repeat Idle Check. Go to step 1 .

IDLE SPECIFICATIONS

Model	Engine Code	RPM
Beetle A/T	AVH &AZG	730-890
Beetle M/T	AVH &AZG	780
Golf A/T	AVH & AZG	730-890
Golf M/T	AVH & AZG	780
Jetta A/T	AVH & AZG	730-890
Jetta M/T	AVH & AZG	780

IDLE SPEED ADJUSTMENT

NOTE: In exceptional circumstances such as customer complaints concerning droning noises and/or vibrations at idling speed, it is permitted to adjust idling speed slightly. Ensure that idling speed is not outside the specified idling range. If the speed is outside tolerance range it is possible that vehicle will fail the next smog check.

Test Requirements

Ensure throttle valve is not damaged or dirty. Throttle valve angle must be less than 10 degrees. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set. No

DTCs stored in ECM.

Generic Scan Tool (Test Procedure)

Turn ignition on, engine off. Follow scan tool manufacturer's instructions to adjust idle. See **IDLE SPECIFICATIONS** table.

Scan Tool VAG 1551/1552 Or VAS 5051/5052 (Test Procedure)

1. Connect scan tool to DLC. DLC is located left side of steering column. See **Fig. 1** .
2. Start engine and idle.
3. Press keys "0" and "1" for address word "Engine Electronics", press keys "1" and "0" for "Adaptation" function 10 and enter by pressing "Q" key.
4. Press keys "0" and "1" for channel number "1" and enter by pressing "Q" key.
5. Change idle speed. When using scan tool VAG 1551 press keys "1" or "3" to move RPM up or down in 10 RPM increments. VAG 1552, VAS 5051 and VAS 5052 uses up and down arrows to move RPM up or down in 10 RPM increments. See **IDLE SPECIFICATIONS** table.
6. After adjusting idle, press"Q" key to enter, "Store changed values?" should display, press "Q" key again to enter. To end adaptation press right arrow key. Press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. If vehicle has A/T, A/T needs to be adapted to its basic setting. See **A/T BASIC SETTING** .

ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE

Mixture Self-Adaptation

The Motronic ME-SFI engine control system regulates air/fuel mixture at a constant 14.7:1 under all engine operating conditions. System automatically compensates for engine wear, injector wear, minor air leaks, and to some degree inaccurate sensors. This automatic control has upper and lower compensating limits. When a lower limit is not reached or an upper limit is exceeded, a DTC is set.

The amount of correction is constantly calculated and permanently stored. After a repair, Motronic ME-SFI control module will automatically adapt again.

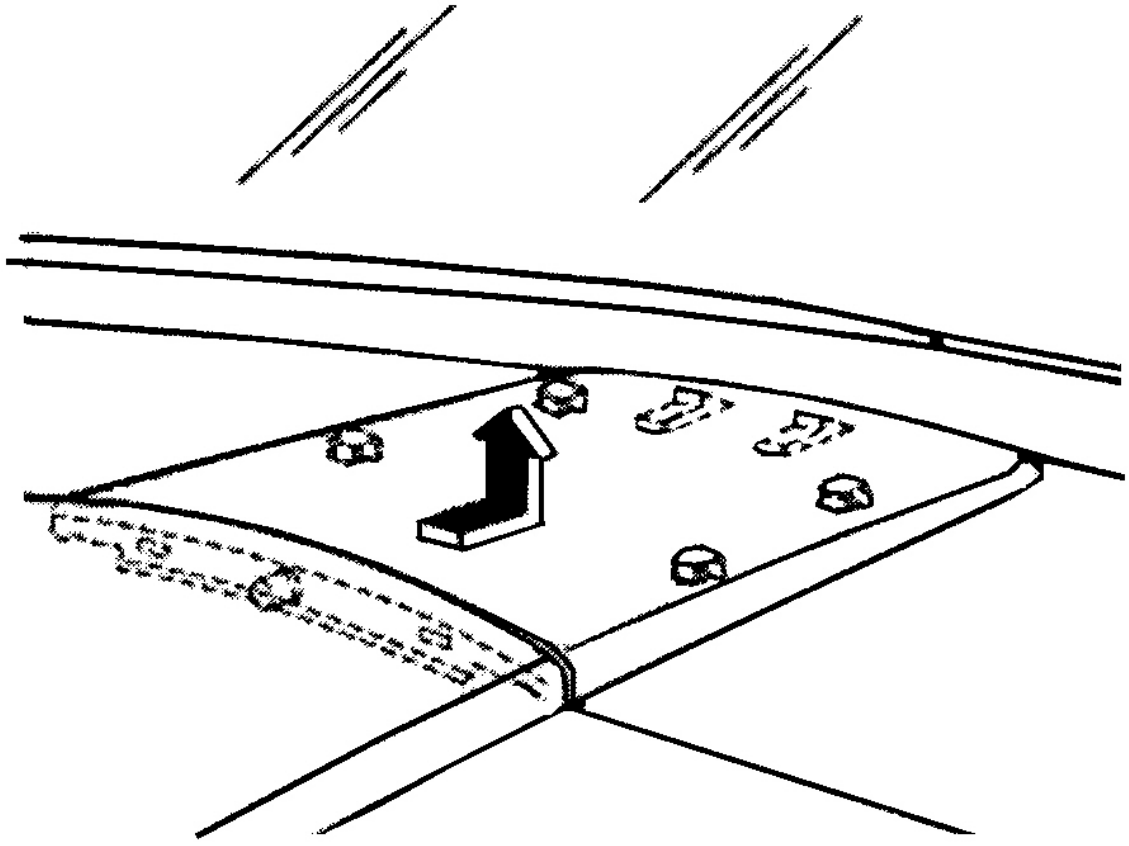
Engine Control Module Removal & Installation

1. Before disconnecting Engine Control Module (ECM) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
2. To remove ECM see specific model below:

Beetle
Turn ignition off. Move center dash panel forward and up. See **Fig. 5** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

Golf & Jetta
Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

3. After installing ECM perform following procedures:
   - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
   - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
   - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
   - On vehicles equipped with A/T, perform adaptation of A/T to its Basic Setting. See **A/T BASIC SETTING** .
   - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
   - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER ADAPTATION TO ECM (J220)** .
   - Perform idle check. See **IDLE CHECK** .
   - Generate ECM readiness code. See **READINESS CODE** .



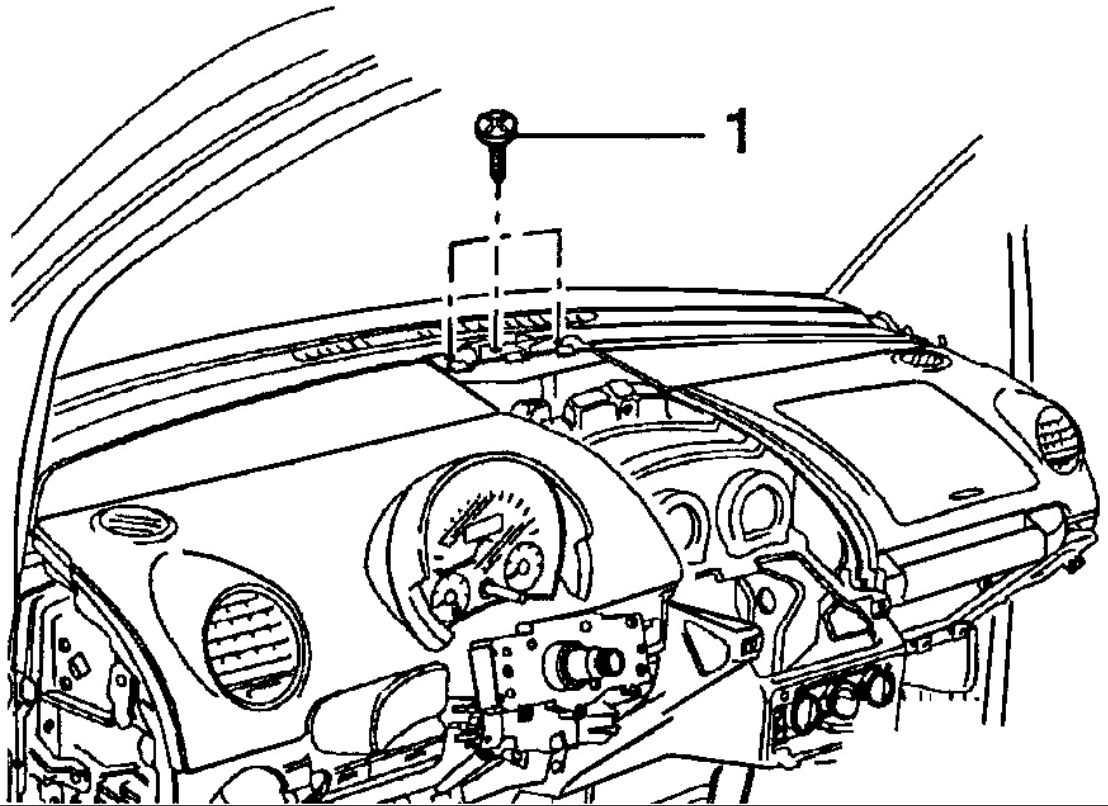

1

Fig. 5: Removing Center & Left Inner Dash Covers (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

ECM GROUND & VOLTAGE SUPPLY

NOTE: Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052). The following tests are preformed using Scan Tool (VAG 1551/1552 or VAS 5051/5052). For location of Data Link Connector (DLC), see Fig. 1 .

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure battery and engine to body grounds are okay. Repair as necessary. Turn off all electrical consumers and A/C. Shift lever in park (A/T) or neutral (M/T). Set parking brake. Battery voltage must a minimum of 11.5 volts. Connect scan tool. See **Fig. 1** . Start engine and idle.
2. Press keys "0" and "1" for address word "Engine Electronics". Press keys "0" and "8" for "Read Measuring Value Block" function 08 and enter by pressing "Q" key. Press keys "0", "0" and "4" for display group "4" and enter by pressing "Q" key. Read ECM voltage supply in "Specified value" window of display field "2". Press right arrow key. Press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.
3. ECM voltage supply should be a minimum of 11.5 volts. Turn ignition off. If voltage is less than battery voltage, go to next step. If voltage is above 14.5 volts, go to step 5 . If voltage checks are okay, ECM power and ground circuits are okay. Test is complete.
4. Check battery, alternator, parasitic load and ECM grounds. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Repair as necessary. If repairs where performed, repeat steps 1 and 2 . If battery, alternator, parasitic load and ECM grounds are okay, go to step 6 .
5. Possible cause is alternator and/or voltage regulator failure. Repair as necessary. If repairs were performed, repeat steps 1 and 2 . If alternator and voltage regulator are okay, go to next step.
6. Turn ignition off. Connect Test Box (VAG 1598/31) to ECM harness connector, leave ECM disconnected from test box. See **CONNECTING VAG TEST BOX** and go to next step.

   NOTE: If test box is not available. Use wiring diagram and DVOM to check ECM grounds and voltage supply. SeeENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

7. Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and a DVOM, measure voltage supply at test box sockets No. 1 and 62 (ground and B+ 30). Battery voltage should be present. Measure voltage supply at test box sockets No. 2 and 62 (ground and B+ 30). Battery voltage should be present.
8. Measure voltage supply at test box sockets No.1 and 3 (ground and ignition 15). Battery voltage should be present. Measure voltage supply at test box sockets No.2 and 3 (ground and ignition 15). Battery voltage should be present. If voltage is not okay, check wires and wiring connections on relay panel. Repair as necessary. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Verify repairs. Test is complete. If both voltage checks are okay. ECM power and ground circuits are okay. Test is complete.

OUTPUT DIAGNOSTIC TEST MODE (FUNCTION 03)

NOTE: **Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Generic scan tool may not be able to perform all test functions. Output Diagnostic Test Mode (DTM) can be aborted by pressing "C" key. DTM will be aborted after 60 seconds, if right arrow key is not pressed again.**

NOTE: **When using scan tool in DTM to activate engine components, some components may be barely audible. Check component by touch or use mechanics stethoscope if necessary. Fuel pump runs continuously during DTM.**

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for entering OUTPUT DIAGNOSTIC TEST MODE.

Scan Tool VAG 1551/1552 or VAS 5051/5052

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "3" for DTM and enter by pressing "Q" key. During output DTM sequence individual components will be activated until advancing to the next component by pressing right arrow key. It is possible to skip a component by pressing arrow key more than once. When finished, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.

NOTE: **Activation sequence of components may vary, depending on current ECM version.**

Output Diagnostic Test Mode activates the following components in sequence:

1. EVAP Canister Purge Valve (N80)
2. Secondary Air Injection Pump Relay (J299)
3. EVAP Leak Diagnostic Pump (V144)
4. Injector, Cylinder 1 (N30)
5. Injector, Cylinder 2 (N31)
6. Injector, Cylinder 3 (N32)
7. Injector, Cylinder 4 (N33)

DRIVE CYCLES

Generate readiness code after performing repairs on exhaust emission systems in order to guarantee that these systems function correctly. If a malfunction is detected during diagnostic, malfunction will be entered in DTC memory. For Test Drive Relearn Procedure and Readiness Code. See **TEST DRIVE RELEARN PROCEDURE** and **READINESS CODE** under PROGRAMMING.

Warm-Up Phase: Engine started with coolant temperature below 122°F (50°C), switched off at above 162°F (72°C).

Road Test: Coolant temperature needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive, all must be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM.

PROGRAMMING

READINESS CODE

NOTE: On Beetle, Golf and Jetta, Throttle Valve Control Module (TVCM - J338) adaptation is part of Readiness Code procedures. TVCM (J338) adaptation can also be performed by it self. See THROTTLE VALVE CONTROL MODULE (J338) .

NOTE: Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Not all eight diagnostic functions in Readiness Code are used. See Fig. 6 . It is recommended that readiness code be read and that readiness code be generated (if necessary) before performing smog check to guarantee that emission relevant systems function correctly. Generate readiness code after performing repairs on exhaust emission systems in order to guarantee that these systems function correctly. If a malfunction is detected during diagnostic, malfunction will be entered in DTC memory.

Readiness Code Description

Readiness code must be generated when ECM memory is cleared, ECM loses battery voltage or is replaced. Readiness Code appears as an 8-digit display after entering function 15 (display Readiness Code function) on scan tool (Scan Tool VAG 1551/1552 or VAS 5051/5052).

Each of the 8 digits is related to a specific exhaust emissions related system. Not all 8 exhaust emission related systems are checked when ECM generates Readiness Code. See **Fig. 6** . Some exhaust emission related systems that are not part of Readiness Code are checked.

During a test sequence OBD (ECM) system checks function of each relevant exhaust emission system. OBD system checks components and generates Readiness Code at regular intervals during normal driving. See **GENERATING READINESS CODE** .

Reading Readiness Code

Before reading readiness code, perform a long road test. Coolant temperature needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. OBD system checks components and generates Readiness Code at regular intervals during normal driving. See **GENERATING READINESS CODE** . Readiness code is erased if DTC memory is erased or voltage supply to ECM is lost.

Reading Readiness Code - Generic Scan Tool

NOTE: Before reading readiness code, perform a long road test. Coolant temperature

needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive, must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. OBD system checks components and generates Readiness Code at regular intervals during normal driving. See GENERATING READINESS CODE . Readiness code is erased if DTC memory is erased or voltage supply to ECM is lost.

To read readiness code, connect scan tool to DLC. DLC is located left side of steering column. See **Fig. 1** . Follow scan tool manufacturer's instructions and read Readiness Code. See **Fig. 6** . Readiness code should display -0 0 0 0 0 0 0 0-. If readiness code does not display as specified, generate Readiness Code. See **GENERATING READINESS CODE** .

Reading Readiness Code - Scan Tool VAG 1551/1552 Or VAS 5051/5052

To read readiness code, connect scan tool to DLC. DLC is located left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics", press keys "1" and "5" for "Readiness code" and enter by pressing "Q" key. Read Readiness Code. See **Fig. 6** . Readiness Code should display -0 0 0 0 0 0 0 0-. If readiness code does not display as specified, press right arrow key and generate Readiness Code. See **GENERATING READINESS CODE** . If Readiness Code displays as specified, Readiness Code diagnostics are complete and no further Readiness Code diagnostics are necessary, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.

Test Requirements For Generating Readiness Code

Ensure throttle valve is not damaged or dirty. Throttle valve angle must be less than 10 degrees. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Generating Readiness Code - Ways To Generate Readiness Code

There are two ways to generate Readiness Code:

1. By performing a five minute test drive. Coolant temperature needs to be greater than 176° F (80° C). Idle for three minutes (do not touch accelerator pedal). Test drive for ten minuetes. Partial throttle, full throttle and overdrive must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM.
2. Idle for three minutes (do not touch accelerator pedal). Test drive for ten minuetes. Partial throttle, full throttle and overdrive must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM.
3. This initiates necessary relevant exhaust emission diagnostics. Readiness Code is then generated when ECM verifies readiness of tested exhaust emission components (Readiness Code is generated at regular intervals during normal driving). Read readiness code. See **READING READINESS CODE** . If Readiness Code displays -0 0 0 0 0 0 0 0-, Readiness Code was generated on test drive and no further Readiness Code diagnostics are necessary.

1. By performing a long road test. Coolant temperature needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive, must all be attained several times.
2. During test drive, apply full throttle until engine speed exceeds 3500 RPM. This initiates necessary relevant exhaust emission diagnostics and Readiness Code is then generated when OBD (ECM) verifies readiness of tested exhaust emission components. Readiness Code is generated at regular intervals during normal driving. Read readiness code. See **READING READINESS CODE** . If Readiness Code displays -0 0 0 0 0 0 0 0-, Readiness Code was generated on test drive and no further Readiness Code diagnostics are necessary.

1. By using scan tool and following a specific Test Procedure. See **GENERATING READINESS CODE - TEST PROCEDURE** .
2. By using scan tool and following manufacturer's instructions to generate Readiness Code. See **GENERATING READINESS CODE - GENERIC SCAN TOOL** .

Generating Readiness Code - Test Procedure

WARNING: When working on vehicles ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). For safety during road test, it is advisable to have a helper operate or observe scan tool from rear seat. If test and measuring instruments are operated from front passenger's seat and vehicle is involved in an accident, there is a possibility the person sitting in this seat may receive serious injuries when air bag is deployed.

NOTE: If ignition is turned off at any time while Generating Readiness Code, Readiness Code will not be generated. When DTC memory is erased or ECM looses power Readiness Code is also erased.

NOTE: If possible it is best to warm-up vehicle by test driving. Connect scan tool to DLC. DLC is located at left side of steering column. See Fig. 1 . During readiness code generating procedure, if test result is indicated as "OK" after selecting a display group, testing has already been carried out and it is okay to proceed to next work step.

Generating Readiness Code - Generic Scan Tool

1. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** .
2. Follow scan tool manufacturer's instructions and generate Readiness Code. See **Fig. 6** . Readiness code should display -0 0 0 0 0 0 0 0-. If readiness code does not display as specified, generate Readiness Code.

Generating Readiness Code - Scan Tool VAG 1551/1552 Or VAS 5051/5052 (Work Steps)

1.

NOTE: When going through Work Steps in Generating Readiness Code procedure

and it is stated that readiness code should read e.g. "X X X X X 1 0 0", X can be a 1 or 0.

NOTE: If during a Work Step test result "OK" is indicated immediately after a display group was selected, test is finalized already. Proceed with next work step. When Generating Readiness Code and going from one Work Step to the next. DO NOT move ignition key into off position.

Turn ignition on, with engine off. Using scan tool, retrieve DTCs. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If DTCs are stored. Repair as necessary. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . If no DTCs are stored, press right arrow key.

2. Using scan tool, clear DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES** After clearing diagnostic trouble codes, press right arrow key.
3. Adapt Throttle Valve Control Module (J338). See **THROTTLE VALVE CONTROL MODULE (J338)** . Go to next step.

4. **EVAP Leak Detection**
   Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Vent fuel tank before diagnostic, by briefly opening and closing fuel tank filler cap. Press keys "2", "0" and "2" for display group 202 and enter by pressing "Q" key. After approximately 2 minutes, display field 4 should display "X X 0 X X 1 X 0". If "X X 0 X X 1 X 0" is displayed, press right arrow key and check next component. If "fine leak" or "large leak" appears in display field 3, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary. If "Abort" appears in display field 3, open and retighten fuel tank filler cap and repeat EVAP Leak Detection diagnostic. DO NOT move ignition key into off position. If "X X 0 X X 1 X 0" is not displayed, check for DTC(s). Repair as necessary.

5. **Knock Sensor Diagnostic**
   Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Ensure Test Requirements have been meet. See **TEST REQUIREMENTS** . Press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "8" for "Read measuring value block" and enter by pressing "Q" key. Press keys "2", "0" and "3" for display group 203 and enter by pressing "Q" key. Test drive vehicle with a helper to observe scan tool from rear seat. Observe display field 4. Accelerate vehicle to above 3000 RPM, allow engine to run at 3000 RPM until display field 4 reads "X X X X X 1 0 0". If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press "right arrow key", check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

6. **Vehicle Speed Diagnostic**
   Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "0" and "4" for display group 204 and enter by pressing "Q" key. Test drive vehicle with a helper to observe scan tool from rear seat. Observe display field 4. Accelerate vehicle to above 3000 RPM, close throttle valve abruptly. Specification after overrun phase, in display field 4 should read "X X X X X 1 0 0". If "X X X X X 1 0 0" is displayed, press "right arrow key" and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

7. **HO2 Sensor, Bank 1, Sensor 1 (Upstream TWC)**

NOTE: Work Steps 7 through 14 can be performed while the accelerator and brake pedals are continually depressed if each step is successful. To change to another display group, see Fig. 7 . In Work Steps 7, 11 and 12 manufacturer does not specify whether HO2 sensor control or heating is being checked.

Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press keys "2", "0" and "5" for display group 205 and enter by pressing "Q" key. Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM (approximately 50 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

8. **HO2 Sensor Aging (Sensor Dynamics), Bank 1, Sensor 1 (Upstream TWC)**
Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "1" and "2" for display group 212 and enter by pressing "Q" key. Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM (approximately 50 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

9. **Fuel Trim Diagnostic (Partial Load)**
Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "1" and "6" for display group 216 and enter by pressing "Q" key. Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM (approximately 70 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

10. **MAF Sensor Diagnostic**
Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "1" and "8" for display group 218 and enter by pressing "Q" key. Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM (up to 180 seconds) until "0 0 0 0 0 X 0 0" appears in display field 4. If "0 0 0 0 0 X 0 0" appears in display field 4, press "C" key and check next component. If "0 0 0 0 0 X 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

11. **HO2 Sensor, Bank 1, Sensor 2 (Behind TWC)**
Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "1" and "9" for display group 219 and enter by pressing "Q" key. Observe display field 3, TWC temperature should be between 392°F (200°C) and 1112°F (600°C). Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM (approximately 50 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

12. **HO2 Sensor, Bank 1, Sensor 2 (Downstream TWC)**
Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "2" and "1" for display group 221 and enter by pressing "Q" key. Observe display field 3, TWC temperature should be between 392°F (200°C) and 1112°F (600°C). Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM (approximately 30 seconds) until "0 0 0 X X 1 0 0" appears in display field 4. If "0 0 0 X X 1 0 0" is displayed, press "C" key and check next component. If "0 0 0 X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

13. **HO2 Sensor Switching, Bank 1, Sensor 2 (Downstream TWC)**
Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "2" and "4" for display group 224 and enter by pressing "Q" key. Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM (approximately 15 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

14. **HO2 Sensor Aging (Sensor Dynamics), Bank 1, Sensor 2 (Downstream TWC)**
Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "2" and "6" for display group 226 and enter by pressing "Q" key. Observe display field 3, TWC temperature should be between 842°F (450°C) and 1364°F (740°C). Observe display field 4. Depress brake pedal, keep brake pedal depressed and accelerate engine to wide open throttle, ECM will increase RPM to approximately 2300 RPM. Continue to run engine at 2300 RPM until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

15. **Fuel Trim Diagnostic (Idle)**

NOTE: Work Steps 15 through 18 are performed at idle speed.

Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at

idle. Press keys "2", "1" and "6" for display group 216 and enter by pressing "Q" key. Observe display field 4. Continue to run engine at idle (approximately 30 seconds) until "X X X X 1 1 0 0" appears in display field 4. If "X X X X 1 1 0 0" is displayed, press "C" key and check next component. If "X X X X 1 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

16. **EVAP (Tank Ventilation)**
    Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "2" and "8" for display group 228 and enter by pressing "Q" key. Observe display field 4. Continue to run engine at idle (approximately 30 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

17. **Secondary Air Injection Diagnostic**
    Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "2" and "9" for display group 229 and enter by pressing "Q" key. Observe display field 4. Continue to run engine at idle (approximately 30 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key and check next component. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

18. **Fuel Trim Diagnostic (Idle)**
    Ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). Allow engine to run at idle. Press keys "2", "3" and "1" for display group 231 and enter by pressing "Q" key. Observe display field 4. Continue to run engine at idle (approximately 30 seconds) until "X X X X X 1 0 0" appears in display field 4. If "X X X X X 1 0 0" is displayed, press "C" key, Fuel Trim Diagnostic (Idle) is complete. Press keys "0", and "6" for function "End Output" and enter by pressing "Q" key and turn ignition off. If "X X X X X 1 0 0" does not appear in display field 4, press right arrow key, check for DTC(s). See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary. Press "C" key. Press keys "0", and "6" for function "End Output" and enter by pressing "Q" key. Turn ignition off.

19. **Read Readiness Code**
    See **READING READINESS CODE - SCAN TOOL VAG 1551/1552 Or VAS 5051/5052** .

Readiness code is generated only when all display values = 0								
1	2	3	4	5	6	7	8	Diagnostic function
							0	Three Way Catalytic Converter (TWC)
						0		TWC heating (not applicable/always "0")
					0			EVAP system and fuel tank leak detection test
				0				Secondary Air Injection (AIR) system
			0					Air conditioning system (currently no diagnostic/always "0")
		0						Oxygen Sensor (O2S) control
	0							Oxygen Sensor (HO2S) heating
0								Exhaust Gas Recirculation (EGR) system (not applicable/always "0")

G00083266

Fig. 6: Identifying Readiness Code
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Display group	VAG 1551	VAG 1552
Higher	Press key 3	Press ↑ key
Lower	Press key 1	Press ↓ key
Skip	Press key C	Press key C

G00083288

Fig. 7: Changing Display Group
Courtesy of VOLKSWAGEN UNITED STATES, INC.

ENGINE CONTROL MODULE (J220) CODING (FUNCTION 07)

1. Connect scan tool to Data Link Connector (DLC). See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If DTCs are present and repairs are needed, see **DTC IDENTIFICATION** table.
2. Erase ECM memory. Manufacturer does not provide ECM coding information for engine codes AVH and AZG. Manufacturer recommends Test Drive Relearn Procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Adapt engine immobilizer. See **IMMOBILIZER ADAPTATION TO ECM (J220)** .
4. On vehicles equipped with A/T, perform adaptation of A/T to its Basic Setting. See **A/T BASIC SETTING** . Adapt A/T kickdown position. See **ADAPTING KICKDOWN FUNCTION** .

CAN DATA BUS OBD INTERFACE (J533) CODING

Engine control module communicates with all control modules capable of transferring data via a CAN

(Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wires twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. Centralized matching resistor is an integral of ECM.

NOTE: Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052). Can Data Bus OBD Interface (J533) is also referred to as "Gateway" by Volkswagen. Can Data Bus OBD Interface (J533) is an integral part of instrument cluster. Can Data Bus OBD Interface (J533) must be coded independently of Instrument Cluster Control Module (J285).

NOTE: From model year 2002, it is not necessary to enter coding for Transmission Control Module (J217), when coding Can Data Bus OBD Interface (J533). From model year 2002, Comfort System Central Control Module (J393) is integrated into Can Data Bus and it is not necessary to enter coding for Comfort System Central Control Module (J393).

Engine Codes AVH/AZG - 2001

Connect scan tool. For location of Data Link Connector (DLC), see **Fig. 1** . Turn ignition on. Press keys "1" and "9" for address word "19" (Gateway) and enter by pressing "Q" key. Press keys "0" and "7" for "Code Control Module" function "7" and enter by pressing "Q" key. Enter code into CAN data bus Interface (J533). For coding options, see **Fig. 8** . Codes from each individual control module are added together to create CAN data bus interface code. Enter (e.g.) 00007 if equipped with A/T, ABS and Airbag, (A/T activated 00001 + ABS activated 00002 + Airbag activated 00004 = 00007).

Control Modules on "Powertrain" CAN Bus	Code:
Automatic transmission	00001
Anti-lock brake system (ABS)	00002
Airbag	00004

G00083279

Fig. 8: Identifying CAN Data Bus Coding Options (2001)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Engine Codes AVH/AZG - 2002 and 2003

Connect scan tool. For location of Data Link Connector (DLC), see **Fig. 1** . Turn ignition on. Press keys "1" and

"9" for address word "19" (Gateway) and enter by pressing "Q" key. Press keys "0" and "7" for "Code Control Module" function "7" and enter by pressing "Q" key. Enter code into CAN data bus Interface (J533). For coding options, see **Fig. 9** . Codes from each individual control module are added together to create CAN data bus interface code. For example, enter 00006 if equipped with ABS and Airbag, (ABS activated 00002 + Airbag activated 00004 = 00006).

Control Modules on "Powertrain" CAN Bus	Code:
Anti-lock brake system (ABS)	00002
Airbag	00004

G00083280

Fig. 9: Identifying CAN Data Bus Coding Options (2002-03)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

THROTTLE VALVE CONTROL MODULE (J338)

Throttle Valve Control Module (TVCM - J338) teaches ECM various positions of throttle valve when ignition is on and engine is not running. Throttle positions are stored in the ECM. Throttle position is communicated to ECM through two angle sensors: Angle sensor 1 for throttle valve drive (G187) and Angle sensor 2 for throttle valve drive (G188). Sensors are integral parts of the TVCM (J338). Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052).

Adapting Throttle Valve Control Module (J338) To ECM (J220)

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 60, (VAG 1551/1552 or VAS 5051/5052). If using generic scan tool, follow scan tool manufacturer's instructions.

NOTE: When adaptation of throttle valve control module is necessary and vehicle is equipped with A/T, the transmission control module must also be adapted. Perform adaptation of A/T to its Basic Setting. See A/T BASIC SETTING .

NOTE: Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 41-194° F (5-90° C). ECM will abort adaptation if; throttle valve cannot be closed completely (e.g.: dirty throttle

body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation.

Generic Scan Tool

If possible it is best to warm-up vehicle by test driving. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Follow scan tool manufacturer's instructions and adapt throttle valve control module to ECM.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. If possible it is best to warm-up vehicle by test driving. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** .
2. Turn ignition on, engine off. Using scan tool, retrieve DTCs. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. If DTCs are stored. Repair as necessary. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . If no DTCs are stored, press right arrow key. Using scan tool, clear DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES** . After clearing codes, press right arrow key. Go to next step.
4. Adapt Throttle Valve Control Module (J338). Press keys "0" and "1" for address word "Engine Electronics", and enter by pressing "Q" key. Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press keys "0", "6" and "0" for "Display Group 60 Basic Setting", and enter by pressing "Q" key.
5. After no longer than 30 seconds, ADP. OK should appear in specification window of display field 4. If APD. OK appears TVCM has adapted successfully. Wait a minimum of 30 seconds before ending "Display Group 60 Basic Setting". To end "Display Group 60 Basic Setting" press right arrow key. Press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.
6. To store values, turn ignition off for at least 25 seconds (control module after-run). If APD. ERROR appears, TVCM has not adapted successfully. Check for DTCs. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

A/T BASIC SETTING

NOTE: A/T basic setting must be initiated when Engine, ECM (J220), A/T Control Module (J217), Throttle Valve Control Module (J338), or Accelerator Pedal Position (APP) sensor 1 (G79) and APP sensor 2 (G185) are replaced. (APP sensor 1 (G79) and APP sensor 2 (G185) are one unit, they are not adjustable and can not be replaced separately). It is also necessary to initiate A/T basic setting if idle speed has been adjusted.

Generic Scan Tool

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Follow scan tool manufacturer's instructions to initiate basic setting for A/T.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** .
2. Turn ignition on, with engine off.
3. Using scan tool check for DTCs. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If any DTCs are present, repair as necessary and clear codes. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
4. Initiate basic setting for A/T. Press keys "0" and "2" for address word "Transmission Electronics", advance scan tool by press right arrow key until "Select Function XX" appears. Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press "0" key 3 times, for "Display Group "0" Basic Setting", and enter by pressing "Q" key. Depress accelerator pedal as far as kickdown and hold in this position for 3 seconds. Press right arrow key.

ADAPTING KICKDOWN FUNCTION

NOTE: Kickdown function adaptation must be performed when ECM or Accelerator Pedal Position (APP) sensor 1 (G79) and APP sensor 2 (G185) are replaced. APP sensor 1 (G79) and APP sensor 2 (G185) are one unit, they are not adjustable and can not be replaced separately.

1. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** .
2. Turn ignition on, with engine off.
3. Press keys "0" and "1" for address word "Engine Electronics". Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press keys "0", "6" and "3" for display group 63 and enter by pressing "Q" key.
4. Observe display zones 3 and 4, "Operate kick down" should display. Press accelerator pedal beyond kick-down pressure point to floor. Hold accelerator pedal to floor for at least 2 seconds. Observe display zones 3 and 4, "Kick Down ADP. runs" should display, then "Kick Down ADP. OK" should appears in display zones 3 and 4.
5. Press right arrow key. Press keys "0" and "6" for function "End output" and enter by pressing "Q" key. If "Kick Down ADP. OK" appeared in display zones 3 and 4, adaptation was successful. If "Kick Down ERROR" appeared in display zones 3 and 4, adaptation was unsuccessful. Check accelerator position sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . Repair as necessary.

ACTIVATING/DEACTIVATING CRUISE CONTROL

Generic Scan Tool

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Follow scan tool manufacturer's instructions to Activating/Deactivating Cruise Control.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

Activating Cruise Control

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on,

engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Press keys "1", "1", "4", "6" and "3" for Code Number 11463 and enter by pressing "Q" key. Turn ignition off. Activation is complete.

Deactivating Cruise Control

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Press keys "1", "6", "1", "6" and "7" for Code Number 16167 and enter by pressing "Q" key. Turn ignition off. Deactivation is complete.

IMMOBILIZER ADAPTATION TO ECM (J220)

NOTE: This article is for adapting new key and readapting currently valid keys only (it is necessary to readapt currently valid keys when adapting new key).

Warning Light for Anti-Theft Immobilizer (K117) is located in speedometer gauge. Properly functioning immobilizer system is indicated by warning light for Anti-Theft Immobilizer (K117) lighting up and going out after approximately 3 seconds when ignition is turned on. Malfunction in immobilizer system is indicated, when ignition is turned on and warning light flashes or lights up continuously. For immobilizer system diagnostics. See appropriate DOOR LOCKS & ANTI-THEFT SYSTEMS article under ACCESSORIES & EQUIPMENT.

NOTE: Manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052. Starting with Model Year 2002 Golf and Jetta are equipped with Immobilizer Generation III (Starting 6/2001 for Beetle). Ignition keys for Immobilizer III may be marked "W3". For more reliable differentiation, always use the function "check control module version". Scan Tool VAS 5051 or 5052 must be used for Immobilizer Generation III diagnoses and coding. A correct Importer/Dealer number must reside in VAS 5051 or VAS 5052 in order to request a PIN number and to adapt Immobilizer Generation III.

NOTE: Three attempts to enter secret code number is initially possible. Next three attempts to enter secret code number is only possible after a minimum of 10 minutes (with ignition remaining on during this time and OBD program is exited by function 06 "End Output"). Waiting period between each three attempts doubles each time up to a maximum of 255 minutes.

Generic Scan Tool

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Follow scan tool manufacturer's instructions for Immobilizer Adaptation.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on using a currently valid key, engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Scratch off

protective coating on new key and read secret code number of new key. Key in secret code number preceded by a "0"into scan tool, e.g. "0", "1", "9", "1" and "5" if secret code number is 1915 and enter by pressing "Q" key. If "Rapid Data Transfer Select Function XX HELP" displays on scan tool, secret code number has been accepted, leave key in on position and go to next step. If "Test Sends Address Word 17" displays on scan tool. Repeat adaptation procedure and re-enter secret code number.

2. Press keys "1" and "0" for "Adaptation" function 10 and enter by pressing "Q" key. Press keys "2" and "1" for "Channel 21" and enter by pressing "Q" key. If "Channel 21 Adapting 2 <-1 3->" displays on scan tool, press right arrow key. Go to next step. If "Function Is Unknown Or Can Not Be Carried Out At The Moment" displays on scan tool. Repeat adaptation procedure and re-enter secret code number.
3. **NOTE: If warning light flashes continuously, key adapting procedure is faulty and must be performed again. Only 30 seconds of ignition on time is given to adapt all keys, 30 seconds start from the time immobilizer warning light goes out when first key is adapted. Warning light flashes quickly and a DTC is stored if 30 seconds are exceeded when adapting all ignition keys. During time period that ignition is turned off, time does not register.**

   If "Channel 21 Adapting 2 Enter Adaptation Value XXXXX" displays on scan tool. Press "0" key 4 times and than enter total number of keys to be adapted, including key in ignition For example, 1 new key, 1 key in ignition and 3 additional keys would be "00005", (a total of 8 keys is maximum). Enter by pressing "Q" key.
4. "Channel 21 Adapting 5 <-1 3->" should display if 5 keys are to be adapted and enter by pressing "Q" key. "Channel 21 Adapting 5 Store Changed Value ?" should display if 5 keys are to be adapted. Press "Q" key to enter. "Channel 21 Adapting 5 Store Changed Value Is Stored" should display if 5 keys are to be adapted. In VDO instrument clusters, warning light for immobilizer should go out. Key in ignition is now adapted.
5. Press right arrow key. Switch ignition off and remove key. Go to next step.
6. Insert next key to be adapted in ignition lock and turn ignition on. Warning light for anti-theft immobilizer lights up for approximately 2 seconds and then goes out. When warning light for anti-theft immobilizer goes out, turn ignition off and remove key. Repeat this procedure until all keys are adapted. Warning light for anti-theft immobilizer flashes briefly after last key is adapted. Press keys "0" and "2" for "Check DTC Memory" function "2". If no DTC(s) are stored adapting of all keys was successful.

NOTE: Identity of ECM is read into the immobilizer control module next time ignition is switched on.

OXYGEN SENSOR ADAPTATION

Checking Oxygen Sensor Adaptation is part of Readiness Code procedures. See **READINESS CODE** . Oxygen sensors are self adapting.

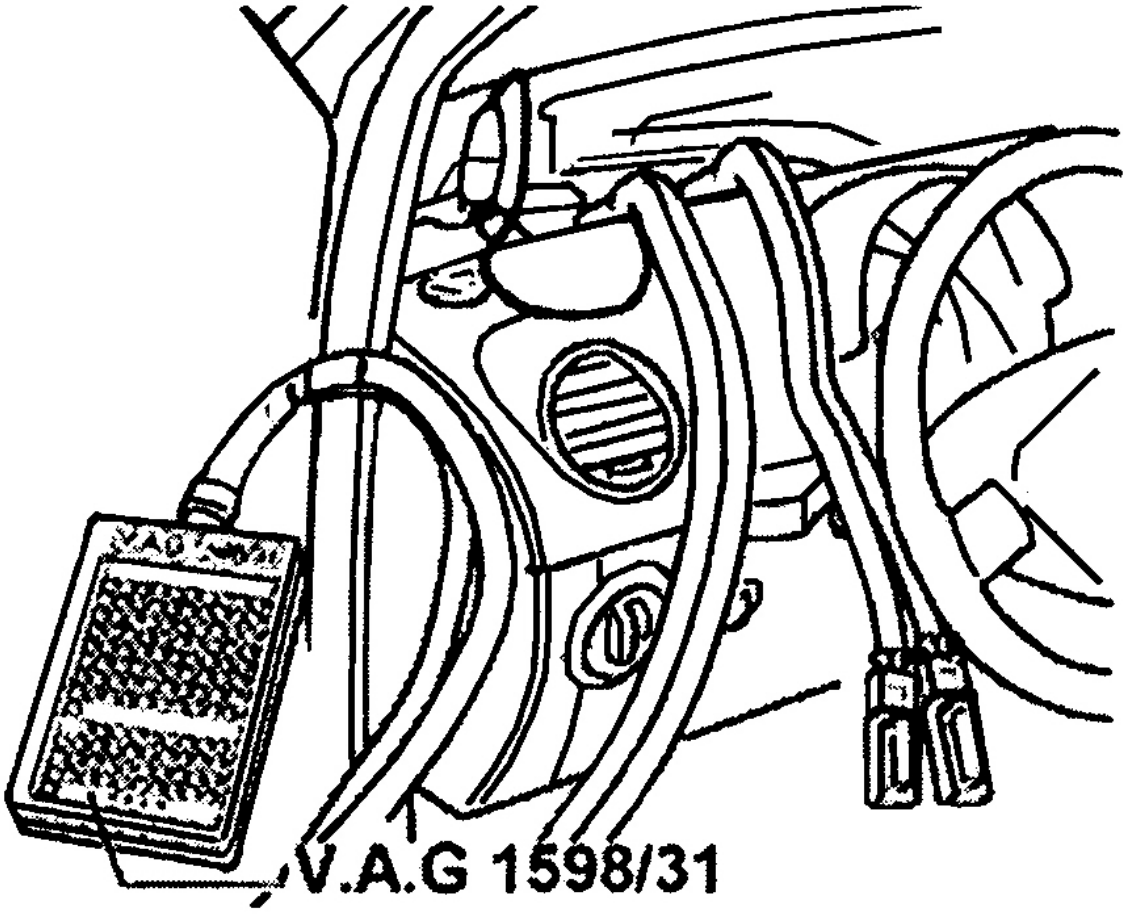
SUMMARY

If no Diagnostic Trouble Codes (DTCs) are present and a no-start condition exists, proceed to appropriate BASIC DIAGNOSTIC PROCEDURES article.

CONNECTING VAG TEST BOX

BEETLE

Turn ignition off. Move center dash panel forward and up. See **Fig. 5** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Connect test equipment. See **Fig. 10** .



G00064788

Fig. 10: Connecting VAG Test Box 1598/31 (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

GOLF & JETTA

Turn ignition off. Remove wiper arms and cowl panel. Connect test equipment. See **Fig. 11** .

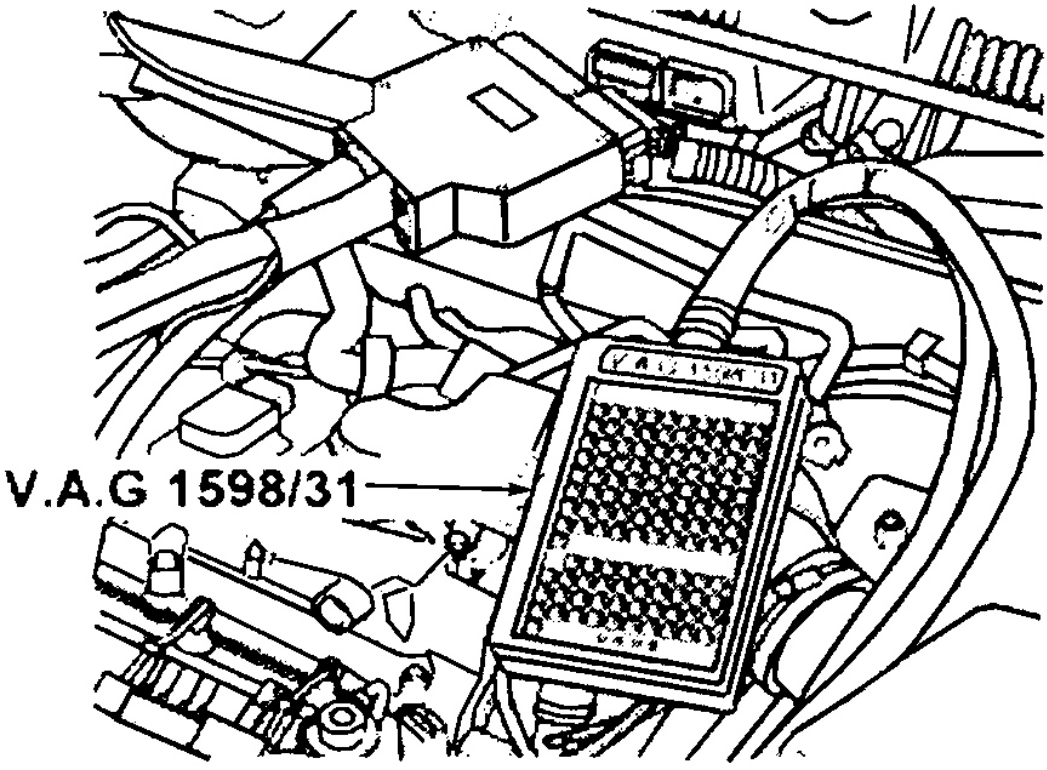


Fig. 11: Connecting VAG Test Box 1598/31 (Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DIAGNOSTIC TROUBLE CODE IDENTIFICATION

NOTE: **Read and record DTCs before starting diagnostic work, (some testing procedures will set DTCs).**

NOTE: **Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Generic scan tool may not be able to perform all test functions. If engine does not start (this test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052). Connect scan tool. Operate starter for approximately 6 seconds, do not switch ignition off. Turn on scan tool printer. Operate scan tool, according to scan tool display information. Check for DTCs.**

Diagnostic information is identified by model and engine code. See **ENGINE CODES (2001-03)** table. Use **DTC IDENTIFICATION** table to identify possible cause. To further understand DTC diagnosis and/or diagnose intermittent failures, see DTC DESCRIPTION under appropriate DTC.

DTC IDENTIFICATION

DTC SAE	DTC VAG	Possible Cause
No Fault Code	No Fault Code	(1)
P0036	**16420**	HO2 Sensor (G130) Downstream TWC - Heating Open Circuit
P0037	**16421**	HO2 Sensor (G130) Downstream TWC - Heating Short To Ground
P0038	**16422**	HO2 Sensor (G130) Downstream TWC - Heating Short To B+
P0101	**16485**	MAF Sensor (G70) - Implausible Signal
P0102	**16486**	MAF Sensor (G70) - Voltage Signal Too Low
P0103	**16487**	MAF Sensor (G70) - Voltage Signal Too High
P0112	**16496**	IAT Sensor (G42) - Signal Too Low
P0113	**16497**	IAT Sensor (G42) - Signal Too High
P0121	**16505**	Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal
P0122	**16506**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
P0123	**16507**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High
P0130	**16514**	HO2 Sensor (G39) Upstream TWC - Heating Circuit Malfunction
P0133	**16517**	HO2 Sensor (G39) Upstream TWC - Signal Too Slow
P0134	**16518**	HO2 Sensor (G39) Upstream TWC - No Activity
P0135	**16519**	HO2 Sensor (G39) Upstream TWC - Heating Element Circuit Malfunction
P0136	**16520**	HO2 Sensor (G130) Downstream TWC - Circuit Malfunction
P0137	**16521**	HO2 Sensor (G130) Downstream TWC - Voltage Too Low
P0138	**16522**	HO2 Sensor (G130) Downstream TWC - Voltage Too High
P0139	**16523**	HO2 Sensor (G130) Downstream TWC - Signal Too Slow
P0139	**16524**	HO2 Sensor (G130) Downstream TWC - No Activity
P0141	**16525**	HO2 Sensor (G130) Heating Downstream TWC - Heating Element Circuit Malfunction
P0170	**16554**	Fuel Trim - Malfunction
P0171	**16555**	Fuel Trim - Too Lean
P0172	**16556**	Fuel Trim - Too Rich
P0201	**16585**	Injector Cylinder 1 (N30) - Electrical Circuit Malfunction
P0202	**16586**	Injector Cylinder 2 (N31) - Electrical Circuit Malfunction
P0203	**16587**	Injector Cylinder 3 (N32) - Electrical Circuit Malfunction
P0204	**16588**	Injector Cylinder 4 (N33) - Electrical Circuit Malfunction
P0221	**16605**	Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal

P0222	**16606**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
P0223	**16607**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High
P0226	**16610**	Accelerator Pedal Position Sensor 1 (G79), Accelerator Pedal Position Sensor 2 (G185) - Implausible Signal
P0230	**16614**	Fuel Pump Relay (J17) - Circuit Malfunction
P0261	**16645**	Injector Cylinder 1 (N30) - Short To Ground
P0262	**16646**	Injector Cylinder 1 (N30) - Short To B+
P0264	**16648**	Injector Cylinder 2 (N31) - Short To Ground
P0265	**16649**	Injector Cylinder 2 (N31) - Short To B+
P0267	**16651**	Injector Cylinder 3 (N32) - Short To Ground
P0268	**16652**	Injector Cylinder 3 (N32) - Short To B+
P0270	**16654**	Injector Cylinder 4 (N33) - Short To Ground
P0271	**16655**	Injector Cylinder 4 (N33) - Short To B+
P0300	**16684**	Misfire Recognized
P0301	**16685**	Cylinder 1 - Misfire
P0321	**16705**	Engine Speed Sensor (RPM) (G28), Implausible Signal Engine Speed Sensor (RPM - G28) - No Signal
P0324	**16708**	Knock Sensor - Malfunction
P0327	**16711**	Knock Sensor 1 (G61) - Signal Too Low
P0328	**16712**	Knock Sensor 1 (G61) - Signal Too High
P0332	**16716**	Knock Sensor 2 (G66) - Signal Too Low
P0333	**16717**	Knock Sensor 2 (G66) - Signal Too High
P0341	**16725**	Camshaft Position Sensor (G40) - Implausible Signal
P0351	**16735**	Ignition Control Cylinder 1 - Malfunction
P0352	**16736**	Ignition Control Cylinder 2 - Malfunction
P0353	**16737**	Ignition Control Cylinder 3 - Malfunction
P0354	**16738**	Ignition Control Cylinder 4 - Malfunction
P0420	**16804**	Catalyst System - Efficiency Below Threshold
P0441	**16825**	EVAP, Fuel Tank Ventilation System - Flow Rate Malfunction
P0442	**16826**	EVAP - Small Leak Detected
P0455	**16839**	EVAP - Very Large Leak Detected
P0456	**16840**	EVAP - Very Small Leak Detected
P0501	**16885**	Vehicle Speed Signal - Implausible Signal
P0506	**16890**	Idle Speed Control - RPM Too Low
P0507	**16891**	Idle Speed Control - RPM Too High
P0513	**16897**	Immobilizer - Incorrect Code
P0568	**16952**	Cruise Control System Switch (E45) - Implausible Signal

P0571	**16955**	Brake Light Switch (F) - Implausible Signal
P0600	**16984**	Data Bus Drive - Missing Signal
P0601	**16985**	ECM (J220) - Malfunction
P0602	**16986**	ECM (J220) - Programming Malfunction
P0604	**16988**	ECM (J220) - Malfunction
P0605	**16989**	ECM (J220) - Malfunction
P0606	**16990**	ECM (J220) - Malfunction
P0638	**17022**	Throttle Valve Control Module (J338) - Implausible Signal
P0642	**17026**	Knock Sensor - ECM Malfunction
P0685	**17069**	Power Supply Relay (J271) - Open Circuit
P0686	**17070**	Power Supply Relay (J271) - Short Circuit To Ground
P0687	**17071**	Power Supply Relay (J271) - Short Circuit To B+
P0688	**17072**	Power Supply Relay (J271) - Open Load Circuit
P1103	**17511**	HO2 Sensor (G39) Upstream TWC - Heating Element Output Too Low
P1105	**17513**	HO2 Sensor (G130) Downstream TWC - Heating Circuit Short To B+
P1113	**17521**	HO2 Sensor (G39) Upstream TWC - Internal Resistance Too High
P1117	**17525**	HO2 Sensor (G130) Downstream TWC - Heating Circuit Short To Ground
P1118	**17526**	HO2 Sensor (G130) Downstream TWC - Heating Circuit Open
P1141	**17549**	Load Detection - Implausible Value
P1142	**17550**	Load Detection - Lower Limit Not Reached
P1143	**17551**	Load Detection - Upper Limit Exceeded
P1145	**17553**	MAF sensor (G70) - Short To B+
P1152	**17560**	HO2 Sensor (G130) Downstream TWC, Lean Control Limit Not Reached HO2 Sensor (G130) Downstream TWC - Control Limit Exceeded
P1166	**17574**	HO2 Sensor (G130) Downstream TWC - Rich Control Limit Exceeded
P1176	**17584**	HO2 Sensor (G39) Correction Upstream TWC, HO2 Sensor (G130) Downstream TWC - Control Limit Reached
P1178	**17586**	HO2 Sensor (G39) Upstream TWC, Pump Current - Open Circuit
P1179	**17587**	HO2 Sensor (G39) Upstream TWC, Pump Current - Short To Ground
P1180	**17588**	HO2 Sensor (G39) Upstream TWC, Pump Current - Short To B+
P1181	**17589**	HO2 Sensor (G39) Upstream TWC, Reference Voltage - Open Circuit
P1182	**17590**	HO2 Sensor (G39) Upstream TWC, Reference Voltage - Short To Ground
P1183	**17591**	HO2 Sensor (G39) Upstream TWC, Reference Voltage - Short To

		B+
P1184	**17592**	HO2 Sensor (G39) Upstream TWC, ECM Ground - Open Circuit
P1185	**17593**	HO2 Sensor (G39) Upstream TWC, ECM Ground - Short To Ground
P1186	**17594**	HO2 Sensor (G39) Upstream TWC, ECM Ground - Short To B+
P1296	**17704**	Malfunction In Cooling System
P1325	**17733**	Knock Control Cylinder 1 - Limit Reached
P1326	**17734**	Knock Control Cylinder 2 - Limit Reached
P1327	**17735**	Knock Control Cylinder 3 - Limit Reached
P1328	**17736**	Knock Control Cylinder 4 - Limit Reached
P1335 (2)	**17743** (2)	Engine Torque Monitoring 2 - Control Limit Exceeded
P1336	**17744**	Engine Torque Monitoring - Control Limit Exceeded
P1337	**17745**	Camshaft Position Sensor (G40) - Short To Ground
P1338	**17746**	Camshaft Position Sensor (G40) - Open Circuit/Short To B+
P1340	**17748**	Camshaft Position Sensor (G40) - Engine Speed Sensor (G28), Incorrect Allocation
P1355	**17763**	Ignition Activation Cylinder 1 - Open Circuit
P1356	**17764**	Ignition Activation Cylinder 1 - Short To B+
P1357	**17765**	Ignition Activation Cylinder 1 - Short To Ground
P1358	**17766**	Ignition Activation Cylinder 2 - Open Circuit
P1359	**17767**	Ignition Activation Cylinder 2 - Short To B+
P1360	**17768**	Ignition Activation Cylinder 2 - Short To Ground
P1361	**17769**	Ignition Activation Cylinder 3 - Open Circuit
P1362	**17770**	Ignition Activation Cylinder 3 - Short To B+
P1363	**17771**	Ignition Activation Cylinder 3 - Short To Ground
P1364	**17772**	Ignition Activation Cylinder 4 - Open Circuit
P1365	**17773**	Ignition Activation Cylinder 4 - Short To B+
P1366	**17774**	Ignition Activation Cylinder 4 - Short To Ground
P1386 (2)	**17794** (2)	ECM (J220) - Malfunction
P1387 (2)	**17795** (2)	ECM (J220) - Malfunction
P1388 (2)	**17796** (2)	ECM (J220) - Malfunction
P1471	**17879**	EVAP Leak Detection Pump (V144) - Short To B+
P1472	**17880**	EVAP Leak Detection Pump (V144) - Short To Ground
P1473	**17881**	EVAP Leak Detection Pump (V144) - Open Circuit
P1475	**17883**	EVAP Leak Detection Pump (V144) - No Signal
P1476	**17884**	EVAP Leak Detection Pump (V144) - Insufficient Vacuum
P1501	**17909**	Fuel Pump Relay (J17) - Short To Ground
P1502	**17910**	Fuel Pump Relay (J17) - Short To B+

P1539	**17947**	Clutch Vacuum Vent Switch (F36) - Implausible Signal
P1541	**17949**	Fuel Pump Relay (J17) - Open Circuit
P1542 (2)	**17950** (2)	Angle Sensor 1 (G187) For Throttle Valve Drive - Implausible Signal
P1545 (2)	**17953** (2)	Throttle Valve Control Malfunction
P1558 (2)	**17966** (2)	Throttle Valve Drive (186) - Circuit Malfunction
P1559 (2)	**17967** (2)	Throttle Valve Control Module (J338) - Malfunction In Basic Setting
P1564 (2)	**17972** (2)	Throttle Valve Control Module (J338) - Voltage Too Low During Basic Setting
P1568 (2)	**17976** (2)	Throttle Valve Control Module (J338) - Mechanical Malfunction
P1570	**17978**	ECM (J220) - Blocked
P1579 (2)	**17987** (2)	Throttle Valve Control Module - Adaptation Not Started
P1602	**18010**	Voltage Supply Terminal 30 (B+) - Voltage Supply Too Low
P1603	**18011**	ECM (J220) - Malfunction
P1609	**18017**	Crash Signal From Airbag Control Module
P1612	**18020**	ECM (J220) - Incorrectly Coded
P1626	**18034**	Drivetrain Data Bus - No Signal From Transmission Control Module (J217)
P1630 (2)	**18038** (2)	Accelerator Pedal Position Sensor 1 (G79) - Signal Too Low
P1631 (2)	**18039** (2)	Accelerator Pedal Position Sensor 1 (G79) - Signal Too High
P1633 (2)	**18041** (2)	Accelerator Pedal Position Sensor 2 (G185) - Signal Too Low
P1634 (2)	**18042** (2)	Accelerator Pedal Position Sensor 2 (G185) - Signal Too High
P1636	**18044**	Drivetrain Data Bus - No Signal From Airbag Control Module (J234)
P1639 (2)	**18047** (2)	Accelerator Pedal Position Sensor 1 (G79) Accelerator Pedal Position Sensor 2 (G185) - Implausible Signal
P1648	**18056**	Drivetrain Data Bus - Malfunction
P1650	**18058**	Drivetrain Data Bus - No Signal From Instrument Cluster Control Module (J285)
P1682	**18090**	Drivetrain Data Bus - Implausible Signal From ABS Control Module (J104)
P1683	**18091**	Drivetrain Data Bus - Implausible Signal From Airbag Control Module (J234)
P1696	**18104**	Data Bus - Implausible Signal From Steering Column Electronics

(1) No Fault Code, Displays "No DTC recognized" (On VAG and VAS Scan Tools). If no fault codes are present but vehicle is malfunctioning, see appropriate SYSTEM & COMPONENT TESTING article and perform appropriate tests.

(2) When this DTC is stored, Malfunction Indicator Light (MIL) and Electronic Power

Control (EPC) light (in instrument cluster), are both illuminated.

COMPONENT LOCATIONS

COMPONENT LOCATING & IDENTIFYING

In diagnostic information, manufacturer identifies all system components with an alpha-numeric identification (e.g., J 220 is for ECM). See **MANUFACTURER'S COMPONENT ALPHA-NUMERIC IDENTIFICATION** table. Component location and pin test points are referenced in the individual DTC test procedures.

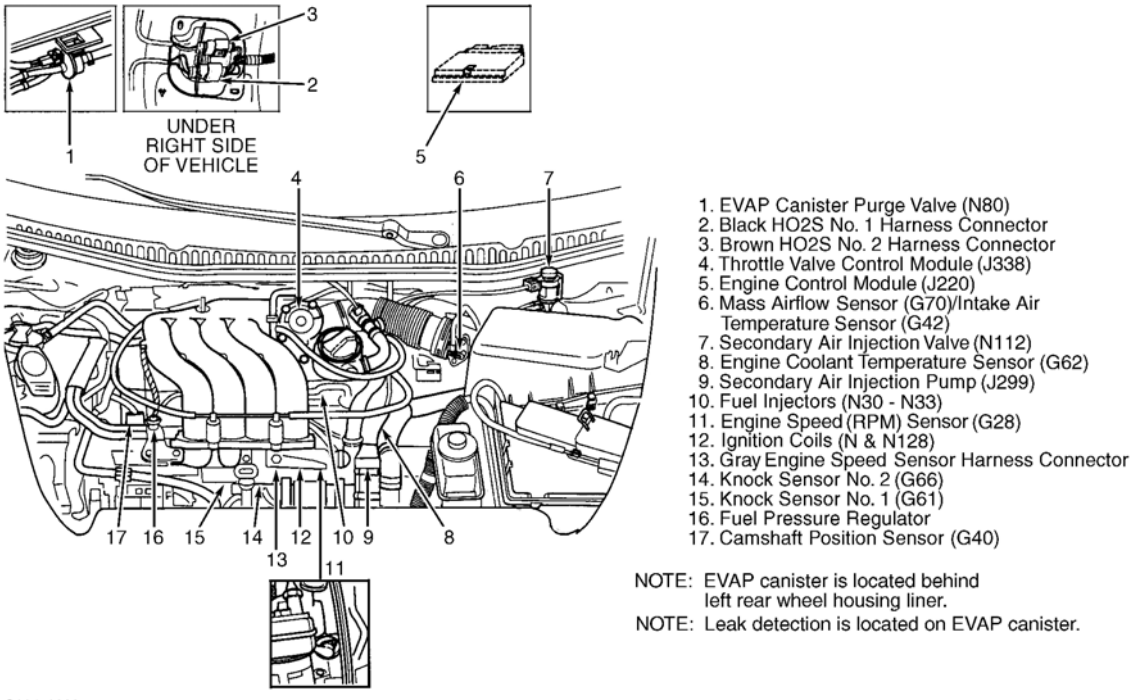
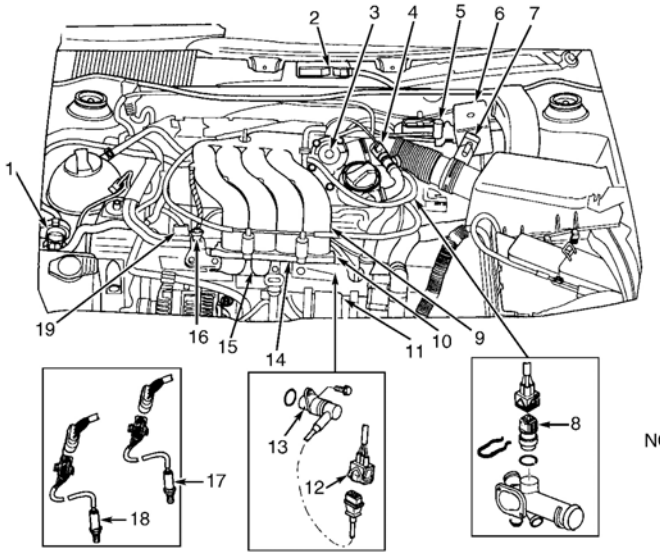

UNDER
RIGHT SIDE
OF VEHICLE
1. EVAP Canister Purge Valve (N80)
2. Black HO2S No. 1 Harness Connector
3. Brown HO2S No. 2 Harness Connector
4. Throttle Valve Control Module (J338)
5. Engine Control Module (J220)
6. Mass Airflow Sensor (G70)/Intake Air Temperature Sensor (G42)
7. Secondary Air Injection Valve (N112)
8. Engine Coolant Temperature Sensor (G62)
9. Secondary Air Injection Pump (J299)
10. Fuel Injectors (N30 - N33)
11. Engine Speed (RPM) Sensor (G28)
12. Ignition Coils (N & N128)
13. Gray Engine Speed Sensor Harness Connector
14. Knock Sensor No. 2 (G66)
15. Knock Sensor No. 1 (G61)
16. Fuel Pressure Regulator
17. Camshaft Position Sensor (G40)
NOTE: EVAP canister is located behind left rear wheel housing liner.
NOTE: Leak detection is located on EVAP canister.
G99J50822

Fig. 12: Locating Engine Control System Components (Beetle - 2.0L Engine Code AEG)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. EVAP Canister Purge Valve (N80)
2. Engine Control Module (J220)
3. Throttle Valve Control Module (J338)
4. PCV Heating Element (N79)
5. Secondary Air Injection Valve (N112)
6. Secondary Air Injection Pump Relay (J299)
7. Mass Airflow Sensor (G70)/Intake Air Temperature Sensor (G42)
8. Engine Coolant Temperature Sensor (G62)
9. Fuel Injectors (N30 - N33)
10. Ignition Coil (N & N128)
11. Secondary Air Injection Pump (V101)
12. Gray Engine Speed Sensor Harness Connector
13. Engine Speed (RPM) Sensor (G28)
14. Knock Sensor No. 2 (G66)
15. Knock Sensor No. 1 (G61)
16. Fuel Pressure Regulator
17. HO2S No. 1 (G39) Before TWC
18. HO2S No. 2 (G130)
19. Camshaft Position Sensor (G40)

NOTE: EVAP canister and leak detection pump are located behind left rear wheel housing liner.

Fig. 13: Locating Engine Control System Components (Golf, GTI & Jetta - 2.0L Engine Code AEG)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

CONNECTOR IDENTIFICATION

Connector location and pin test points are referenced in the individual DTC test procedures.

NOTE: Alpha-numeric identification in MANUFACTURER'S COMPONENT ALPHA-NUMERIC IDENTIFICATION table is only a partial list. These are the components pertaining to engine performance.

MANUFACTURER'S COMPONENT ALPHA-NUMERIC IDENTIFICATION

Component	Alpha-Numeric Identification
ABS Control Module	J104
ABS Warning Light	K47
Accelerator Position Sensor 1	G79
Accelerator Position Sensor 2	G185
Air Bag Control Module	J234
Air Bag Warning Light	K75
AC Control Module	J255
Angle Sensor 1 For Throttle Valve Drive	G187
Angle Sensor 2 For Throttle Valve Drive	G188
Barometric Pressure Sensor (Inside ECM)	G96
Brake Booster Sensor	G294
Brake Light Switch	F
Brake Pedal Switch	F47

Brake Vacuum Pump Motor	V192
CAN Data Bus Interface (Gateway)	J533
Camshaft Position Sensor	G163
Charge Air Pressure Sensor	G31
Clutch Pedal Switch	F36
Comfort Systems Central Control Module	J393
ECM	J220
ECM Power Supply Relay	J271
ECT Sensor	G62
Engine Coolant Level Sensor	G32
Engine Speed (RPM) Sensor	G28
EPC Warning Light	K132
EVAP Canister Purge Valve	N80
EVAP Leak Detection Pump	V144
Fuel Pump	G6
Fuel Pump Relay	J17
HO2S Upstream TWC	G39
HO2S Downstream TWC	G130
IAT Sensor	G42
Ignition Coil With Power Output Stage	N70, N127, N129 & N292
Immobilizer Induction Coil	D2
Immobilizer Warning Light	K117
Injectors	N30-N33
Instrument Cluster Control Module (Also Used By Immobilizer)	J285
Knock Sensor 1	G61
Knock Sensor 2	G66
MAF Sensor	G70
Malfunction Indicator Light	K83
Oil Level Sensor	G266
Oil Pressure Switch	F1
Oil Pressure Warning Light	K3
Power Steering Switch	F88
Recirculating Valve For Turbocharger	N249
Secondary Air Injection Valve	N112
Secondary Air Pump Motor	V101
Secondary Air Pump Relay	J299
Steering Control Module	J453
Steering Sensor	G85

Throttle Valve Control Module	J338
Throttle Valve Drive	G186
Transmission Control Module (Automatic Transmission)	J217
Valve For Camshaft Adjustment	N205
Vehicle Speed Sensor (Speedometer)	G22
Wastegate By-Pass Regulator Valve	N75

DIAGNOSTIC TESTS

CAUTION: Perform all resistance and voltage tests with a Digital Volt-ohmmeter (DVOM) with minimum 10-megohm impedance, unless stated otherwise in test procedures. Ensure ignition switch is in OFF position when performing resistance tests.

NOTE: Read and record DTCs before starting diagnostic work. Some testing procedures will set DTCs.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be e.g. loose contact or a brief open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTC(s) will be erased from ECM memory. A warm-up phase is, engine started with coolant temperature below 122°F (50°C) - switched off at above 162°F (72°C).

NOTE: To properly diagnose vehicle, vehicle manufacturer recommends use of Scan Tool (VAG 1551/1552 or VAS 5051/5052) and Test Box (VAG 1598). Following test procedures are using Scan Tool (VAG 1551 or 1552) and Test Box (VAG 1598). Test box terminal numbers and ECM terminal numbers are identical. To identify connector terminal wire colors, see ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

NOTE: Before replacing any component, verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure all wiring is okay and connectors at component and ECM are clean and tight. When codes have been cleared or voltage supply to ECM has been interrupted, ECM loses all "learned" and "basic" values. Serious driveability problems may occur depending on vehicle

mileage. After reconnecting ECM, it is necessary to perform relearn procedure. See TEST DRIVE RELEARN PROCEDURE .

DTC P0036/16420, P0037/16421 & P0038/16422: HO2S DOWNSTREAM TWC

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P0036/16420
HO2 Sensor (G130) Downstream TWC - Heating Open Circuit

DTC P0037/16421
HO2 Sensor (G130) Downstream TWC - Heating Short To Ground

DTC P0038/16422
HO2 Sensor (G130) Downstream TWC - Heating Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

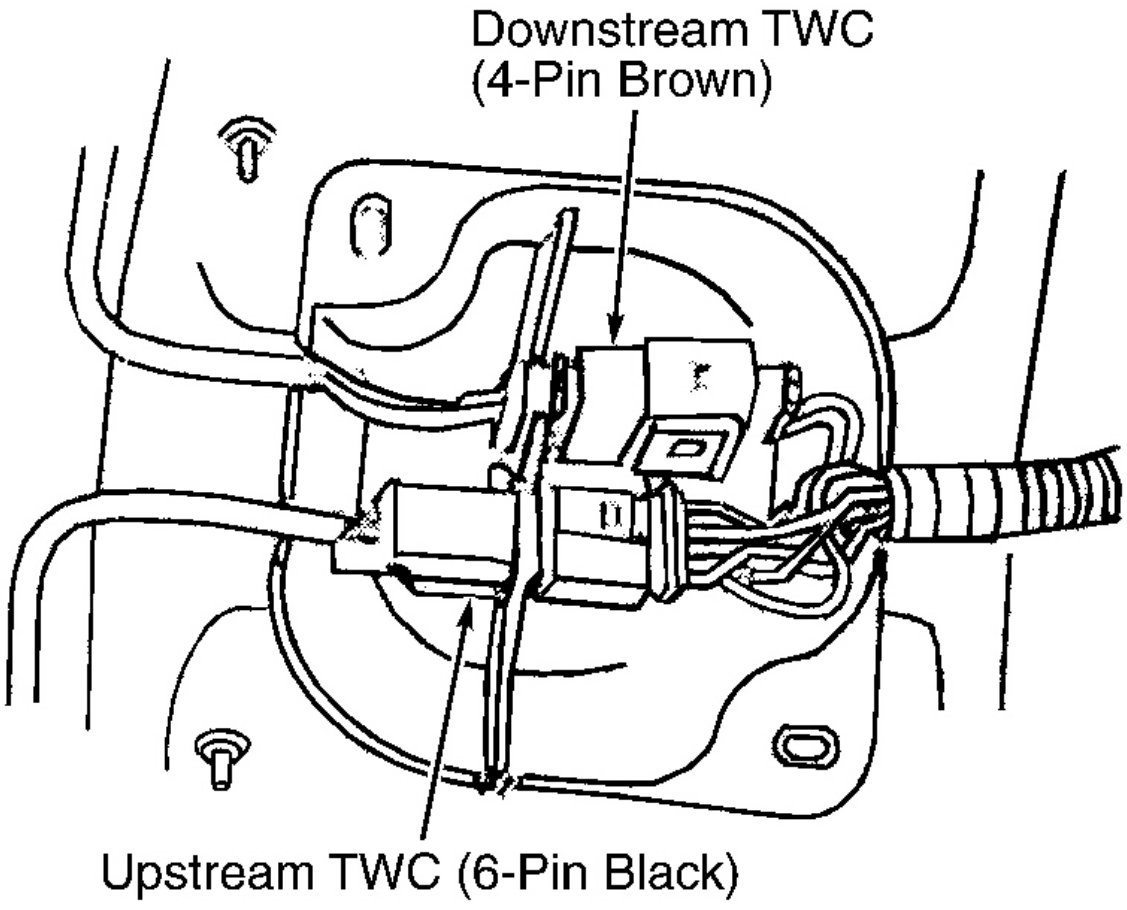
1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step (further testing is needed).
3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (Brown 4-pin). See **Fig. 14** .
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 15** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 16** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 16** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 12-0 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7.

NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S control signal is not within specifications it may set a DTC for HO2S heater malfunction.

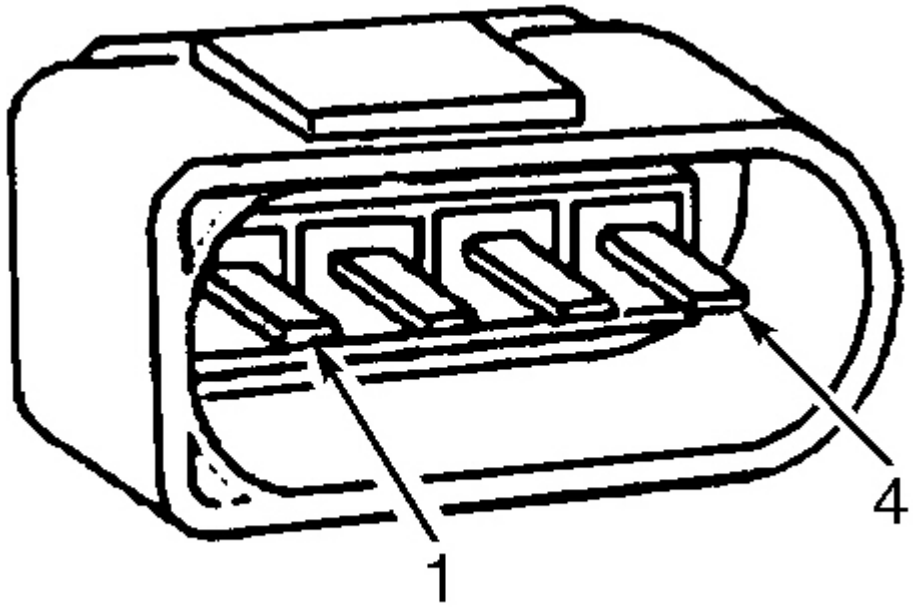
Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 16** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083385

Fig. 14: Locating Heated Oxygen Sensors Protective Cover & Identifying Harness Connectors (Beetle, Golf & Jetta)

Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083387

Fig. 15: Identifying Heated Oxygen Sensor Terminals - Downstream TWC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

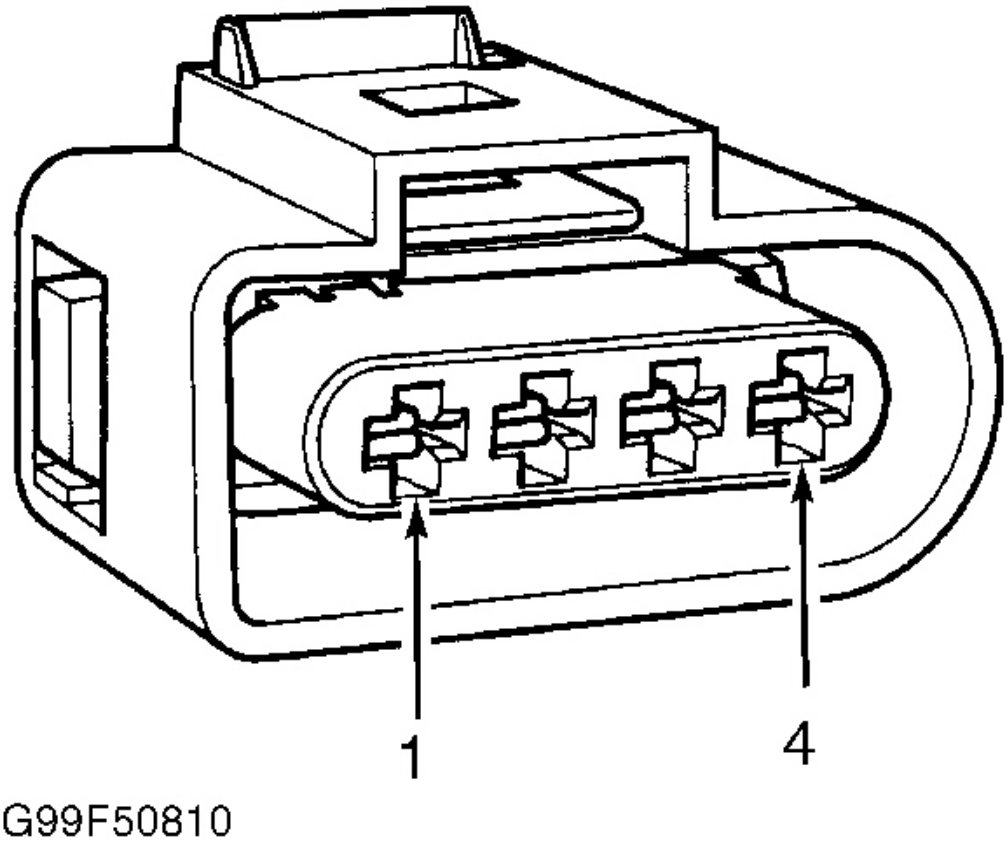


Fig. 16: Identifying Heated Oxygen Sensor Harness Connector Terminals - Downstream TWC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0101/16485, P0102/16486 & P0103/16487: MAF SENSOR

Code Definition

DTC P0101/16485
MAF Sensor (G70) - Implausible Signal

DTC P0102/16486
MAF Sensor (G70) - Voltage Signal To Low

DTC P0103/16487
MAF Sensor (G70) - Voltage Signal To High

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Inspect air induction system for leaks. Check air filter Check air filter for blockage. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle. Using scan tool, check air mass drawn in by engine. Air mass should be 2.0-5.0 grams/second at idle. If air mass reading is okay, go to next step (voltage supply for MAF sensor must be checked). If air mass reading is not okay, go to step 6 .
3. Turn ignition off. Disconnect MAF sensor 5-pin connector. Start engine and idle. Using DVOM, measure voltage between MAF sensor 5-pin connector, terminal No. 2 and ground. See **Fig. 18** . Voltage should be 11-15 volts. If voltage is okay, go to step 5 . If voltage is not okay, go to next step.
4. Turn ignition off. Repair wiring from MAF sensor 5-pin connector, terminal No. 2 and fuel pump relay (J17). See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition on. Using DVOM, check voltage between MAF sensor 5-pin connector, terminal No. 4 and ground. See **Fig. 18** . Voltage should be 4.5-5.5 volts. If voltage is okay, go to next step (further circuit tests are required). If voltage is not okay, go to next step.
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following MAF sensor (G70) connector terminals and test box sockets. See **Fig. 18** .
   - MAF sensor harness connector terminal No. 3 and test box socket No. 27.
   - MAF sensor harness connector terminal No. 4 and test box socket No. 53.
   - MAF sensor harness connector terminal No. 5 and test box socket No. 29.

   Resistance should be a maximum of 1.5 ohms for each reading. If resistance measurements are okay, go to next step. If any resistance measurement is not okay, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Using DVOM, check wiring in MAF sensor 5-pin connector for short circuit to one another, short circuit to ground, and short circuit to B+. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If circuits are okay, go to next step.
8. If all wiring, voltage checks, and grounds are okay, and DTC P0101/16485, DTC P0102/16486 or DTC P0103/16487 return, replace faulty MAF sensor (G70). After repairs, erase DTC memory. Verify Repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0112/16496 & P0113/16497: IAT SENSOR

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P0112/16496
IAT Sensor (G42) - Signal Too Low

DTC P0113/16497
IAT Sensor (G42) - Signal Too High

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

NOTE: If sensor or wiring is defective, ECM operates with a substitute intake air temperature of 67.1°F (19.5°C). For harness connector terminal wire colors, see ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

Test Procedure

NOTE: Engine must be cold before performing test procedure.

1. **NOTE: When viewing/testing IAT sensor resistance on MAF/IAT sensor terminals pay particular attention to position of MAF/IAT sensor and terminal number/orientation for IAT sensor (there is a squared and a rounded end at exterior of MAF/IAT terminal housing). See Fig. 17 .**

   Disconnect MAF/IAT sensor harness connector, (MAF/IAT sensor is located in air intake duct assembly next to air cleaner). Using DVOM, measure resistance of IAT sensor between MAF/IAT sensor terminals No. 1 and 3. See **Fig. 17** . See **IAT SENSOR RESISTANCE** table. If IAT sensor resistance is okay, reconnect MAF/IAT sensor harness connector. Go to next step. If resistance is not okay, replace faulty MAF/IAT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Go to next step.
3. Turn ignition on. Using scan tool, check IAT sensor temperature value. If IAT sensor temperature value

deviates greatly from underhood ambient temperature, go to step 6 . If IAT sensor temperature value is approximately the same as underhood ambient temperature, go to next step.

4. **NOTE: Next test step tests IAT sensor through its full range.**

   Turn ignition off. Disconnect MAF/IAT sensor harness connector from MAF/IAT sensor. Remove MAF/IAT sensor. Reconnect MAF/IAT sensor harness connector. Turn ignition on. Using a chilling agent, cool IAT sensor. Using scan tool, observe IAT sensor temperature value. Temperature value should steadily decrease. If IAT sensor temperature value steadily decreased. Go to next step. If IAT sensor temperature value did not steadily decrease, replace faulty MAF/IAT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Erase DTC memory. Test drive vehicle. If DTC P0112/16496 or DTC P0113/16497 returns, go to step 9 . If DTC P0112/16496 or DTC P0113/16497 does not return, test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. If IAT sensor temperature value is extremely low, approximately -40°F (-40°C), possible cause is open circuit or short to B+. Turn ignition off. Go to next step. If IAT sensor temperature value is extremely high, approximately 284°F (140°C), possible cause is short to ground. Turn ignition off. Go to step 8 .
7. Disconnect MAF/IAT sensor harness connector. For MAF/IAT sensor location. Using a jumper wire, bridge MAF/IAT sensor harness connector terminals No. 1 and 3. See **Fig. 18** . Turn ignition on. Using scan tool, observe IAT sensor temperature value. If IAT sensor temperature value is approximately -40°F (40°C), turn ignition off. Go to step 9 . If IAT sensor temperature value is approximately 284°F (140°C), turn ignition off. Replace faulty MAF/IAT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Disconnect MAF/IAT sensor harness connector. Turn ignition on. Using scan tool, observe IAT sensor temperature value. If after disconnecting MAF/IAT sensor harness connector, temperature value is approximately -40°F (-40°C), turn ignition off. Replace faulty IAT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If after disconnecting MAF/IAT sensor harness connector, temperature value is approximately 284°F (140°C), turn ignition off. Go to next step.
9. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect MAF/IAT sensor harness connector. Using DVOM, measure resistance between MAF/IAT sensor harness connector terminal No. 1 and test box socket No. 26. See **Fig. 18** . Record resistance reading. Using DVOM, measure resistance between MAF/IAT sensor harness connector terminal No. 3 and test box socket No. 27. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
10. Check MAF/IAT sensor harness connector terminal No. 1 and 3 for short circuit to battery positive and ground. Also verify MAF/IAT sensor harness connector circuits are not shorted to each other. Repair wiring harness as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and IAT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IAT SENSOR RESISTANCE

Temperature °F (°C)	Ohms
86 (30)	1500-2000
104 (40)	1000-1500
122 (50)	800-1000
140 (60)	500-700
158 (70)	375-500
176 (80)	275-375
194 (90)	225-275

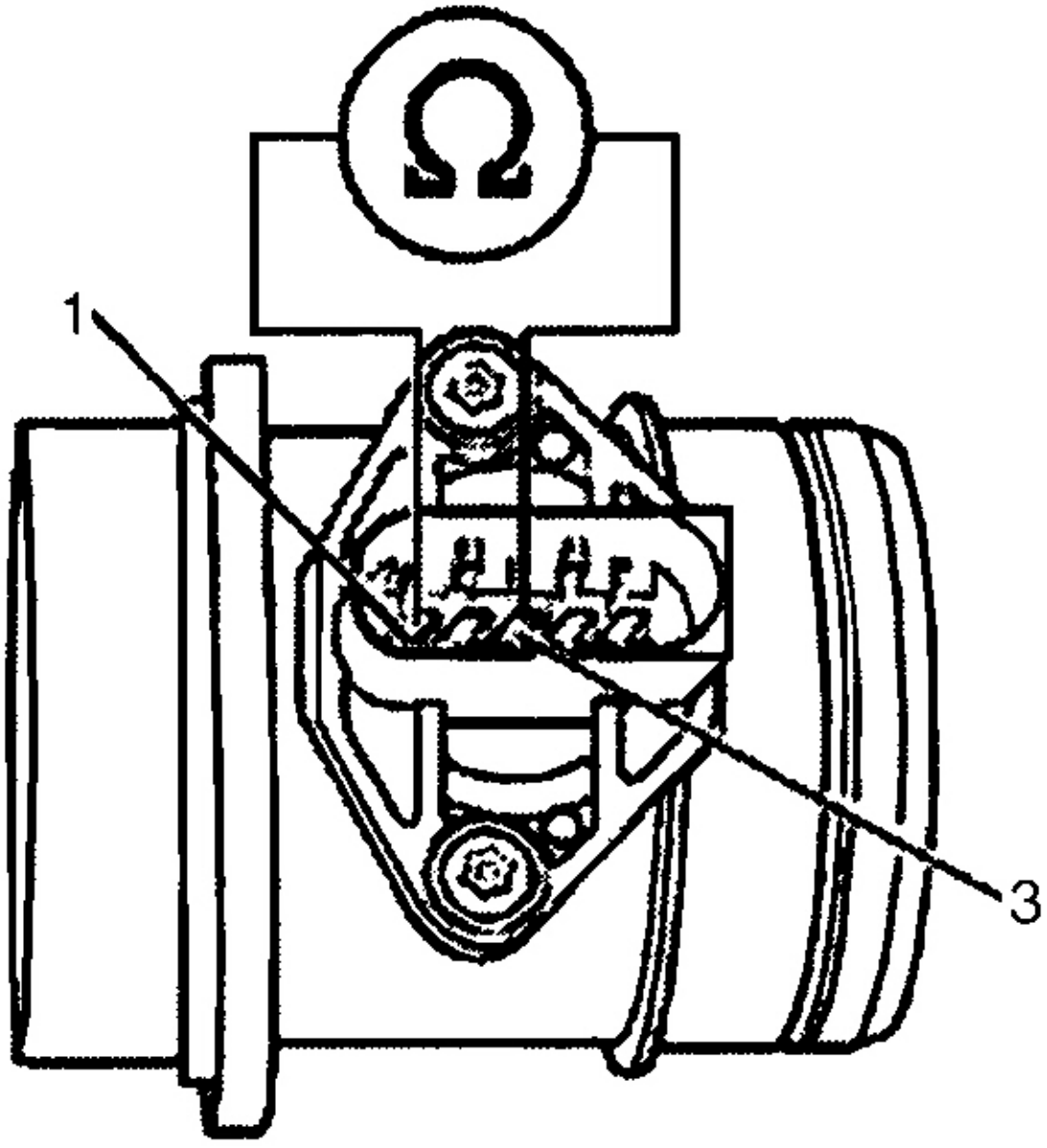


Fig. 17: Testing IAT Sensor (G42) (Beetle, Golf & Jetta - 2.0L)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

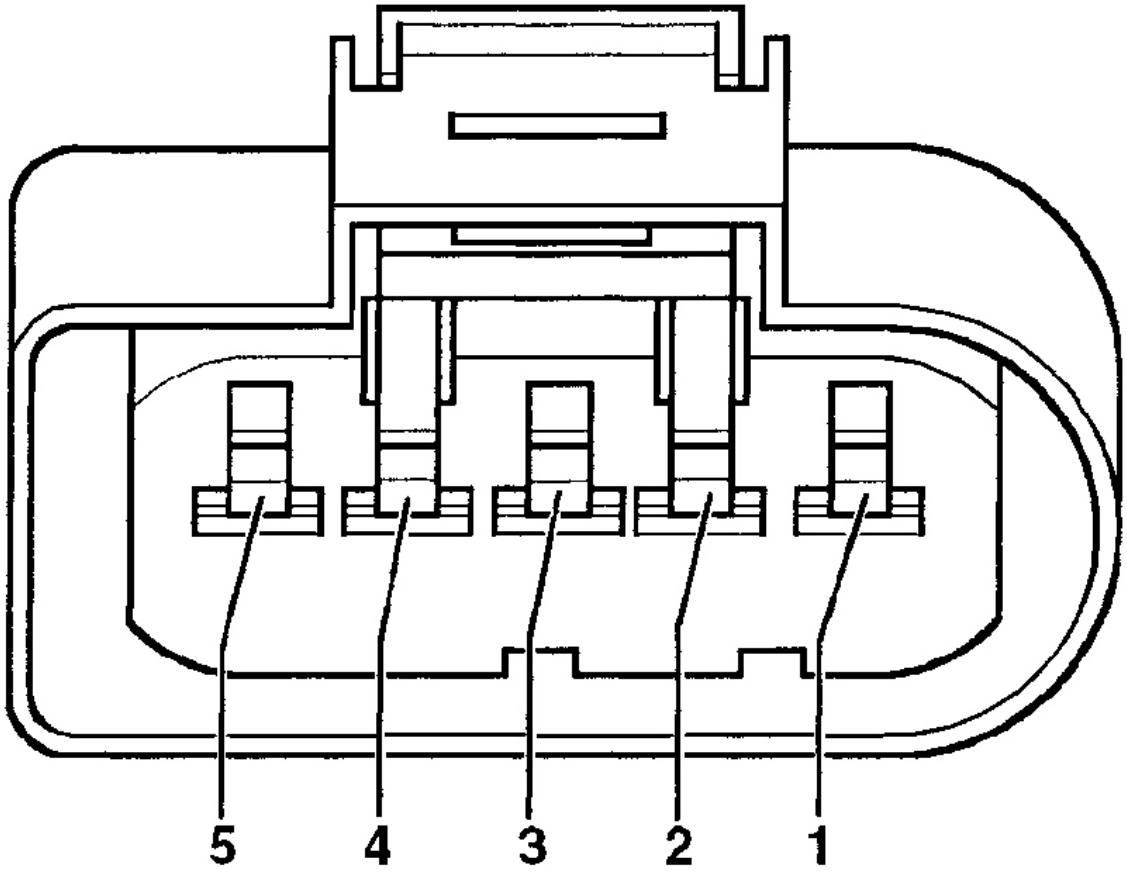


Fig. 18: Identifying Mass Airflow Sensor (G70) & IAT Sensor (G42) Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

DTC P0121/16505, P0122/16506 & P0123/16507: ANGLE SENSOR 2

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P0121/16505
Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal

DTC P0122/16506
Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low

DTC P0123/16507
Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-93 percent.

Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 19** . Specification is one to 5 ohms.
2. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188) at idle stop. Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 16 percent. Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 82 percent.
4. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts).

Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 7 . If throttle valve drive angle sensor tests are okay, go to next step.

5. Check Accelerator Pedal Position (APP) sensors. See **DTC P0226/16610** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
6. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt accelerator pedal position sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118
6	91

8. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 20** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

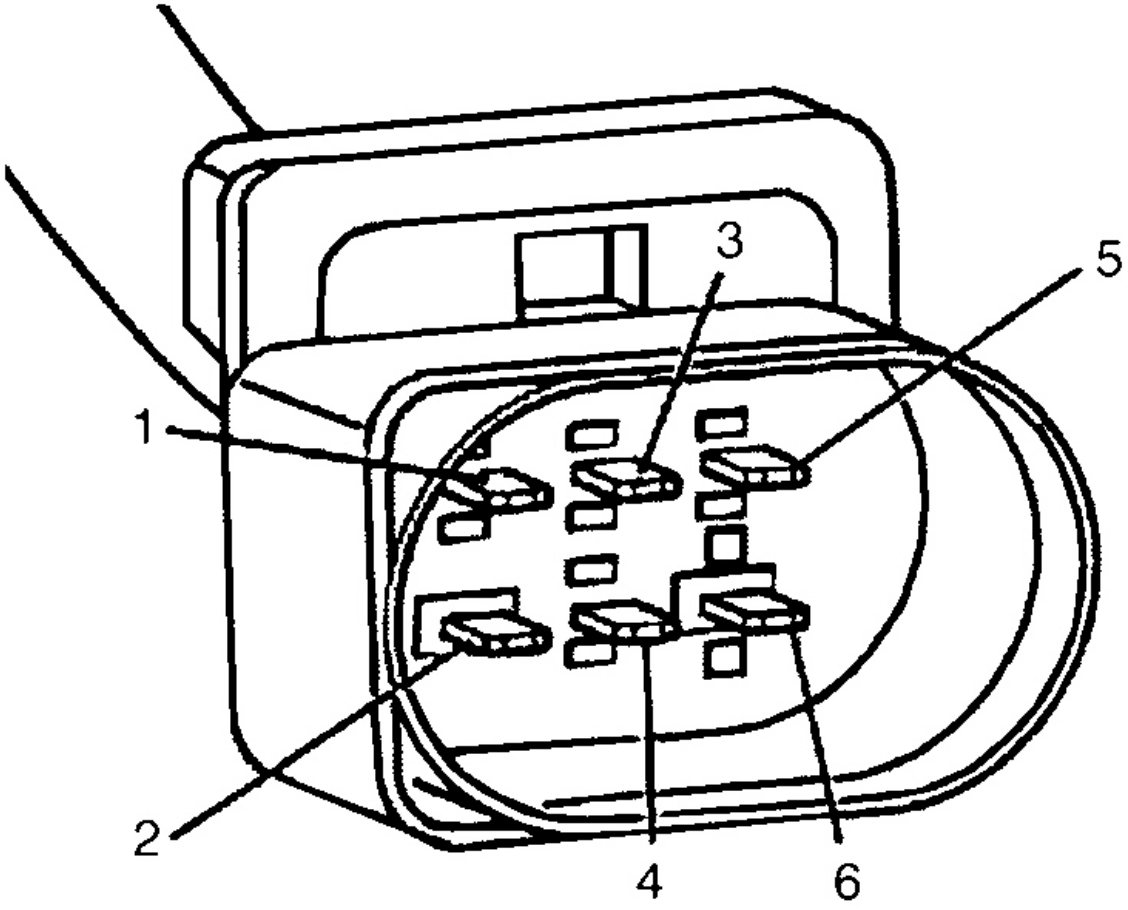
TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

9. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME

SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

10. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00095569

Fig. 19: Identifying Throttle Valve Control Module Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

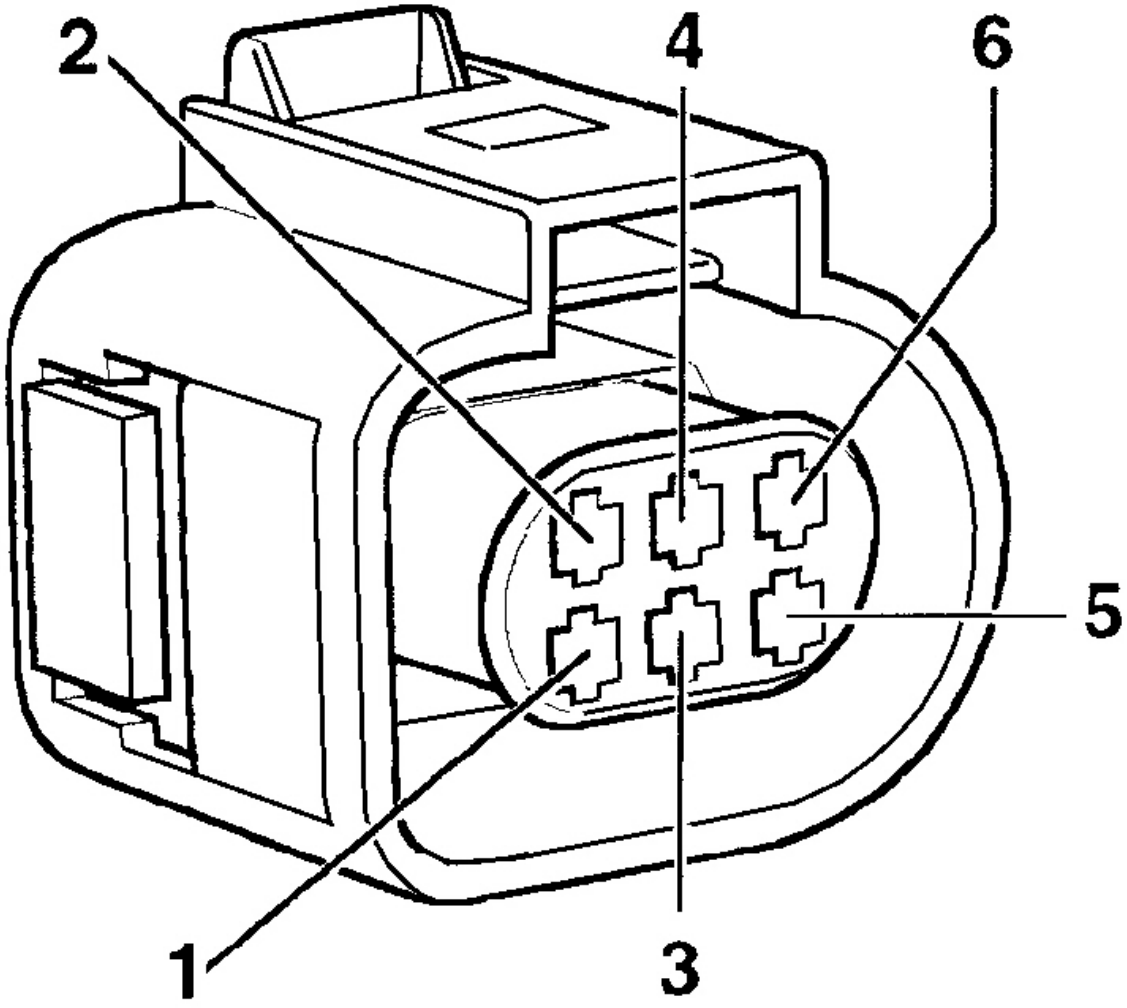


Fig. 20: Identifying Throttle Valve Control Module Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

DTC P0130/16514 & P0135/16519: HO2S UPSTREAM TWC

NOTE: **If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

DTC P0130/16514
HO2 Sensor (G39) Upstream TWC - Heating Circuit Malfunction

DTC P0135/16519
HO2 Sensor (G39) Upstream TWC - Heating Element Circuit Malfunction

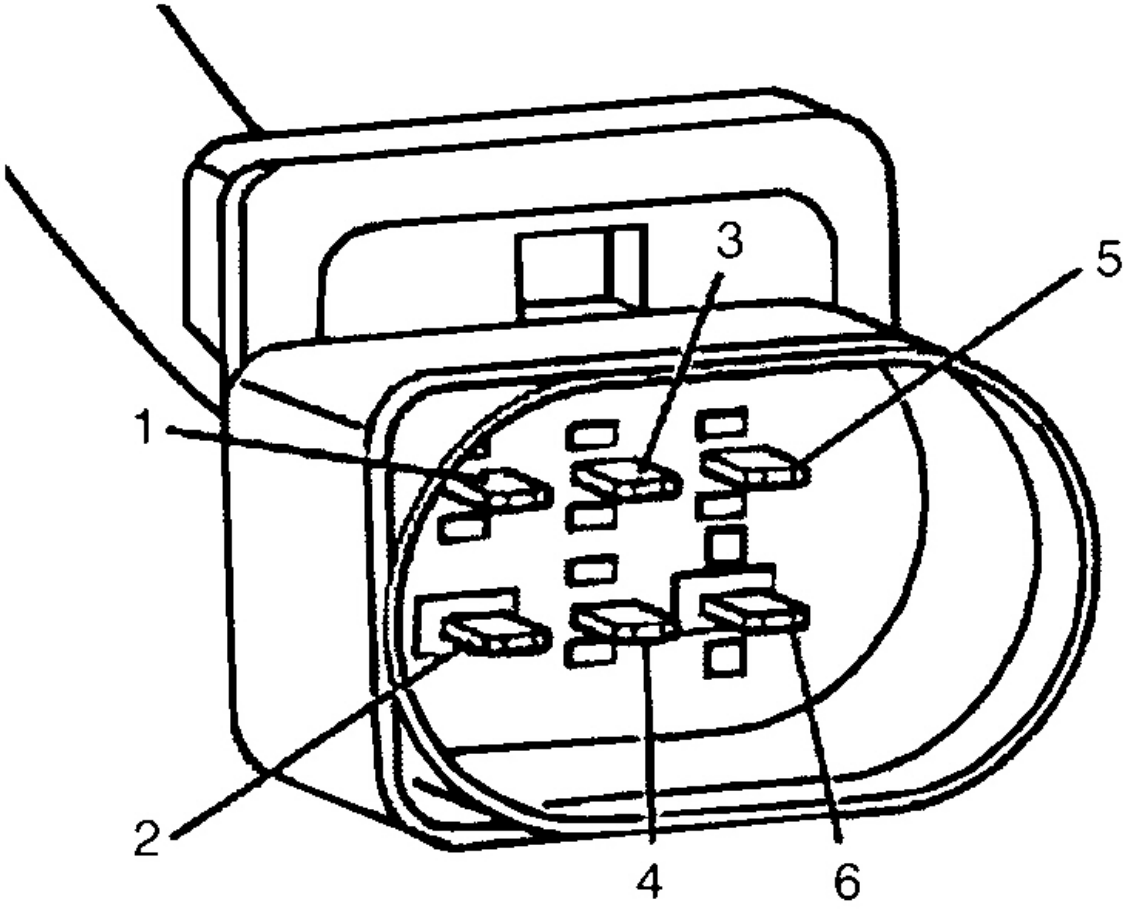
Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

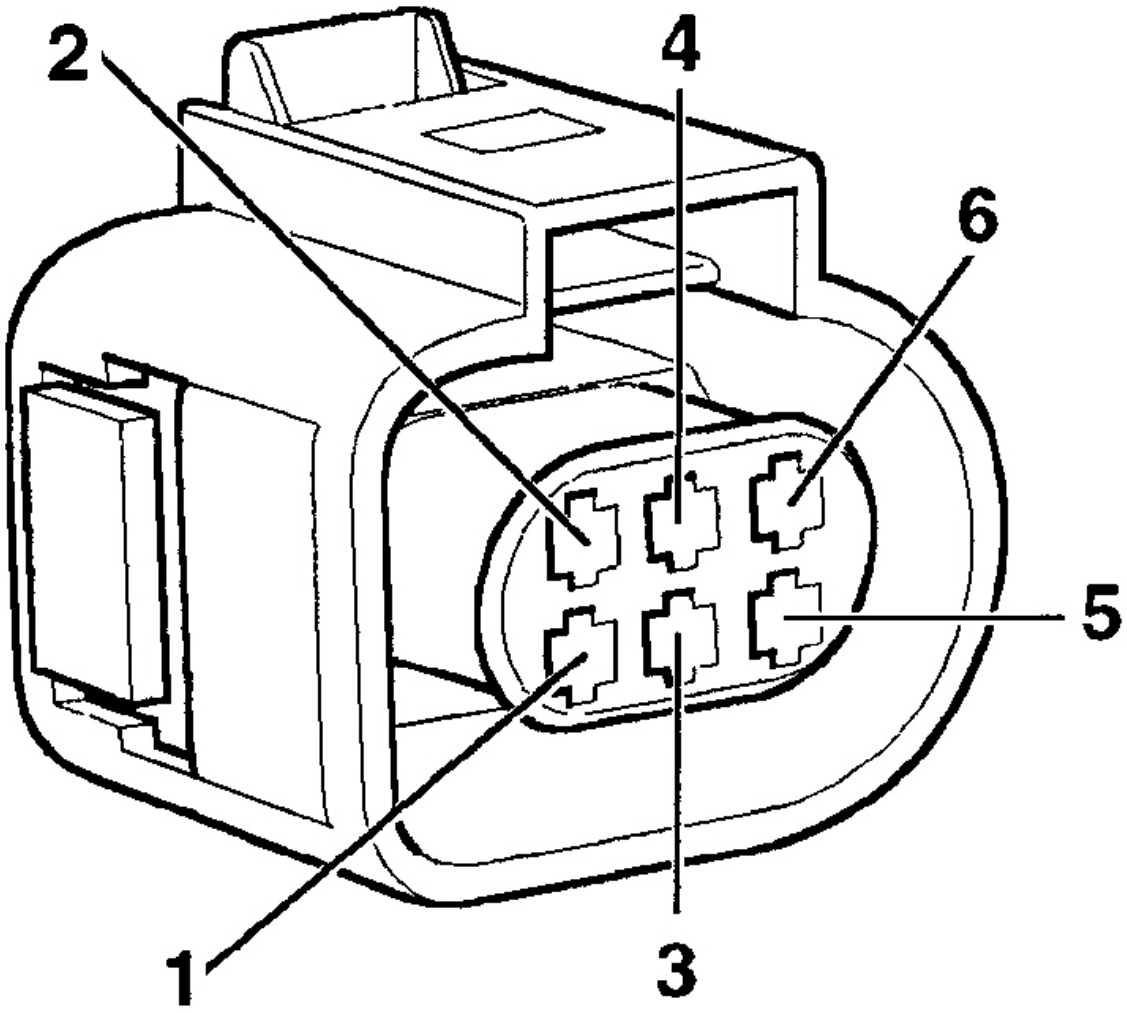
1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating between on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step (further testing is needed).
3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (Black 6-pin). See **Fig. 14** .
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 21** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 22** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector, See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 22** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 12-0 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0170/16554, DTC P0171/16555 & DTC P0172/16556 . If HO2S control signal is not within specifications it may set a DTC for HO2S heater malfunction.**

Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 22** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00095569

Fig. 21: Identifying Heated Oxygen Sensor Terminals (G39) - Upstream TWC
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00073531

Fig. 22: Identifying Heated Oxygen Sensor Harness Connector Terminals - Upstream TWC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0133/16517 & P0134/16518: HO2S UPSTREAM TWC

Code Definition

DTC P0133/16517
HO2 Sensor (G39) Upstream TWC - Signal Too Slow (Aging)

DTC P0134/16518
HO2 Sensor (G39) Upstream TWC - No Activity (Aging)

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist.

Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: Manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to next step. If using generic scan tool, follow scan tool manufacturer's instructions, check aging of upstream HO2S. If scan tool indicates aging of upstream HO2S is not okay, go to step 4 . If scan tool indicates aging of upstream HO2S is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "system in basic setting 34". Using accelerator pedal prop manually set engine speed to 2300-2500 RPM. Maintain engine speed of 2300 to 2500 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 2300 to 2500 RPM until scan tool displays specification "B1-S1 OK". If scan tool does not display "B1-S1 OK", go to next step. If scan tool displays "B1-S1 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0136/16520, P0137/16521 & P0138/16522: HO2S DOWNSTREAM TWC

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P0136/16520
HO2 Sensor (G130) Downstream TWC - Circuit Malfunction

DTC P0137/16521
HO2 Sensor (G130) Downstream TWC - Voltage Too Low

DTC P0138/16522
HO2 Sensor (G130) Downstream TWC - Voltage Too High

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: If no fault is found when using this Test Procedure, check downstream HO2S (G130) heater. See DTC P0141/16525: HO2 SENSOR (G130) DOWNSTREAM TWC, HEATING ELEMENT CIRCUIT MALFUNCTION .

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) control signal activation. HO2S control signal should be activated. Use scan tool to check downstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in downstream HO2S heater activation test mode. Heater should be on. If activation and readiness checks are okay and HO2S heater is on. Go to next step, (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0141/16525: HO2 SENSOR (G130) DOWNSTREAM TWC, HEATING ELEMENT CIRCUIT MALFUNCTION** .
3. **NOTE: Downstream HO2S (G130) control signal activation may only occur above 1500 RPM.**

   NOTE: Downstream HO2S voltage does not fluctuate in the same manner as upstream HO2S. Downstream HO2S voltage may vary in very small increments, approximately 0.1 volt or less (e.g. 0.6 to 0.7 volt), within a specification range of 0.1 to 0.9 volt. When engine, HO2Ss and catalytic converter are in good working order, downstream HO2S voltage may not switch at all in a defined RPM range (e.g.: 1500 RPM). See Fig. 23 .

   Using scan tool, check downstream HO2S control signal switching voltage. Downstream HO2S voltage should vary in very small increments, approximately 0.1 volt or less (e.g. 0.6 to 0.7 volt within specification range of 0.1 to 0.9 volt). If downstream HO2S voltage remains constant at any of the voltages identified in **DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE** table, go to step 5 . If HO2S does not remain constant at any of the voltages identified in **DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE** table, go to next step. If downstream HO2S

voltage is okay (voltage is fairly constant, but does not match voltages identified in **DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE** table), test is complete. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

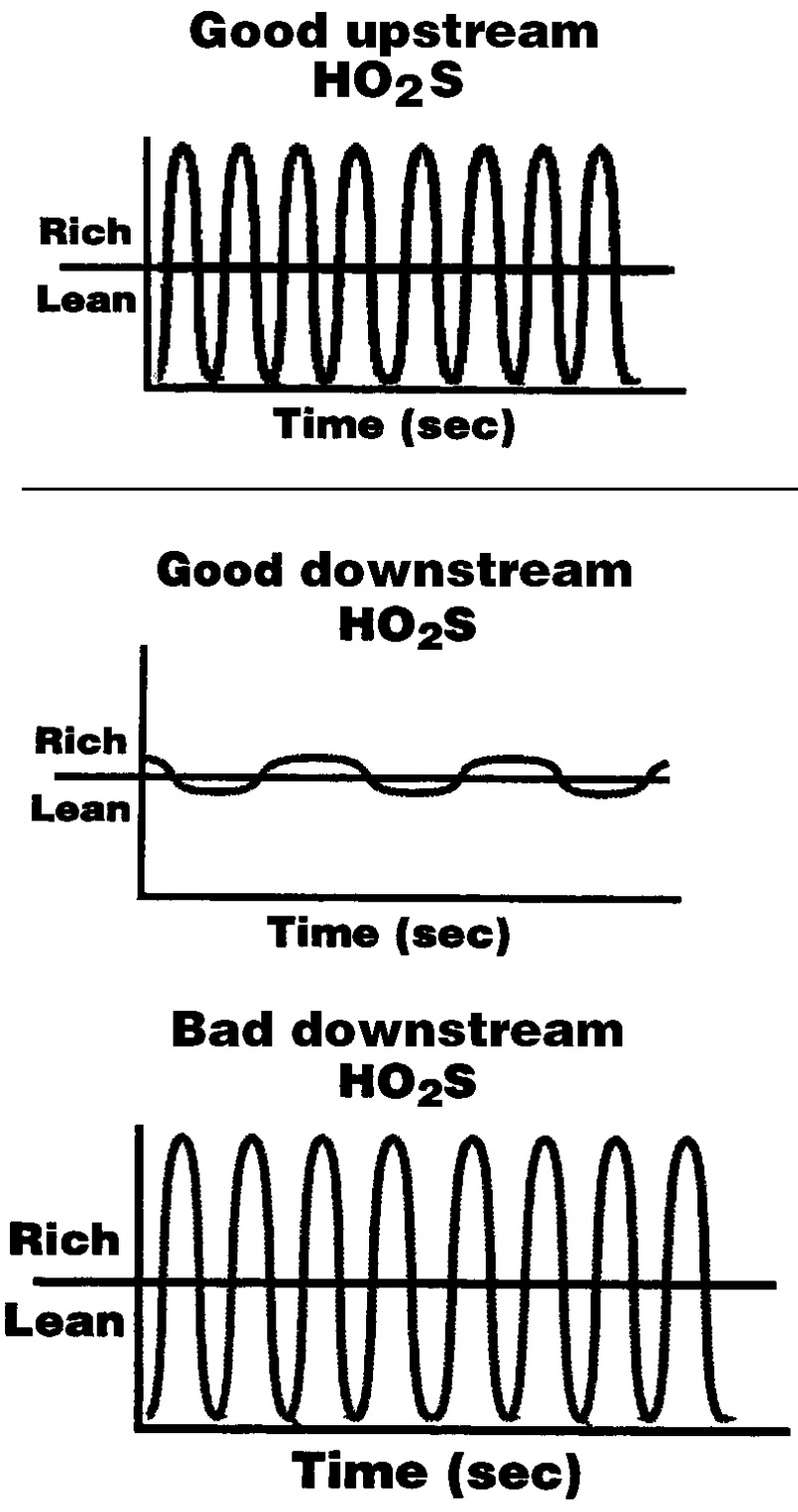
DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE

Downstream HO2S Voltage	Possible Fault (1)
0.0	Possible Short To Ground
1.1	Possible Short To B+
0.4-0.5	Possible Open Circuit (ECM Supplied Basic Voltage)

(1) Voltages identified in this table indicate a fault with downstream HO2S switching voltage.

4. Test drive vehicle (to burn HO2S clean) and retest system. If test voltage is okay after test drive, go to next step. If test voltage is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover. Disconnect downstream HO2S (G130) harness connector (Brown 4-pin). See **Fig. 14** . Go to next step.
6. Turn ignition off. Connect DVOM between terminals No. 3 and 4 of downstream HO2S harness connector. See **Fig. 16** . Start engine, check ECM supplied basic voltage. Turn ignition off. Voltage should be 0.4 to 0.5 volt. If voltage is not okay, go to next step. If voltage is okay, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following downstream HO2S harness connector terminals and test box sockets. See **Fig. 16** .
   - Downstream HO2S connector terminal No. 3 and test box socket No. 68.
   - Downstream HO2S connector terminal No. 4 and test box socket No. 69.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in downstream HO2S 4-pin harness connector for short circuits to one another. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083388

Fig. 23: Identifying HO2S Patterns
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0139/16523 & P0140/16524: HO2S DOWNSTREAM TWC

Code Definition

DTC P0139/16523
HO2 Sensor (G39) Downstream TWC - Signal Too Slow (Aging)

DTC P0140/16524
HO2 Sensor (G39) Downstream TWC - No Activity (Aging)

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: Manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052.**

   NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to switch from "Test off" to "Test on".

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to next step. If using generic scan tool, follow scan tool manufacturer's instructions, check aging of upstream HO2S. If scan tool indicates aging of upstream HO2S is not okay, go to step 4 . If scan tool indicates aging of upstream HO2S is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "system in basic setting 43". Using accelerator pedal prop manually set engine speed to 2300-2500 RPM. Maintain engine speed of 2300 to 2500 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 2300 to 2500 RPM until scan tool displays specification "B1-S2 OK". If scan tool does not display "B1-S2 OK", go to next step. If scan tool displays "B1-S2 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0141/16525: HO2 SENSOR (G130) DOWNSTREAM TWC - HEATING ELEMENT CIRCUIT MALFUNCTION

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, further testing is needed.
3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (Brown 4-pin). See **Fig. 14** .
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 15** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 16** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector. SeeENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM

between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 16** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 12-0 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7.

NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16522, DTC P0137/16521 & DTC P0138/16522 . If HO2S control signal is not within specifications it may set a DTC for HO2S heater malfunction.

Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 16** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0170/16554, P0171/16555 & P0172/16556: FUEL TRIM

Code Definition

DTC P0170/16554
Fuel Trim - System Malfunction

DTC P0171/16555
Fuel Trim - Too Lean

DTC P0172/16556
Fuel Trim - Too Rich

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. Check air filter for blockage. If no air

leaks are found and air intake is unrestricted, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

2. **NOTE: Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If activation and readiness checks are okay and HO2S heater is on. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .

3. **NOTE: Operating range of upstream HO2S is negative 25 to positive 25 percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to positive 10 percent specification is allowed to vary slightly.**

   Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay, go to step 7 .

4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** .
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, go to next step. If fuel injector volume is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. See **DTC P0440/16824 & DTC P0441/16825** . If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve

is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

10.

NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.

Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

11. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover. Disconnect upstream HO2S (G39) harness connector (Black 6-pin). See **Fig. 14** .
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 22** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.

    Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0201/16585, P0202/16586, P0203/16587 & P0204/16588: FUEL INJECTOR CIRCUIT MALFUNCTION

Code Definition

DTC P0201/16585
Injector Cylinder 1 (N30) - Electrical Circuit Malfunction

DTC P0202/16586
Injector Cylinder 2 (N31) - Electrical Circuit Malfunction

DTC P0203/16587
Injector Cylinder 3 (N32) - Electrical Circuit Malfunction

DTC P0204/16588
Injector Cylinder 4 (N33) - Electrical Circuit Malfunction

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

Test Procedure

1. **NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 8 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 24** . Resistance must be 14-18 ohms at room temperature (resistance should be greater than 14-18 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors. Test light may not go out completely, but should dull and get brighter during activation.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 25** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector harness connector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .
4. Check resistance between terminal No. 1 of fuel injector harness connector that does not illuminate and fuel pump relay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel

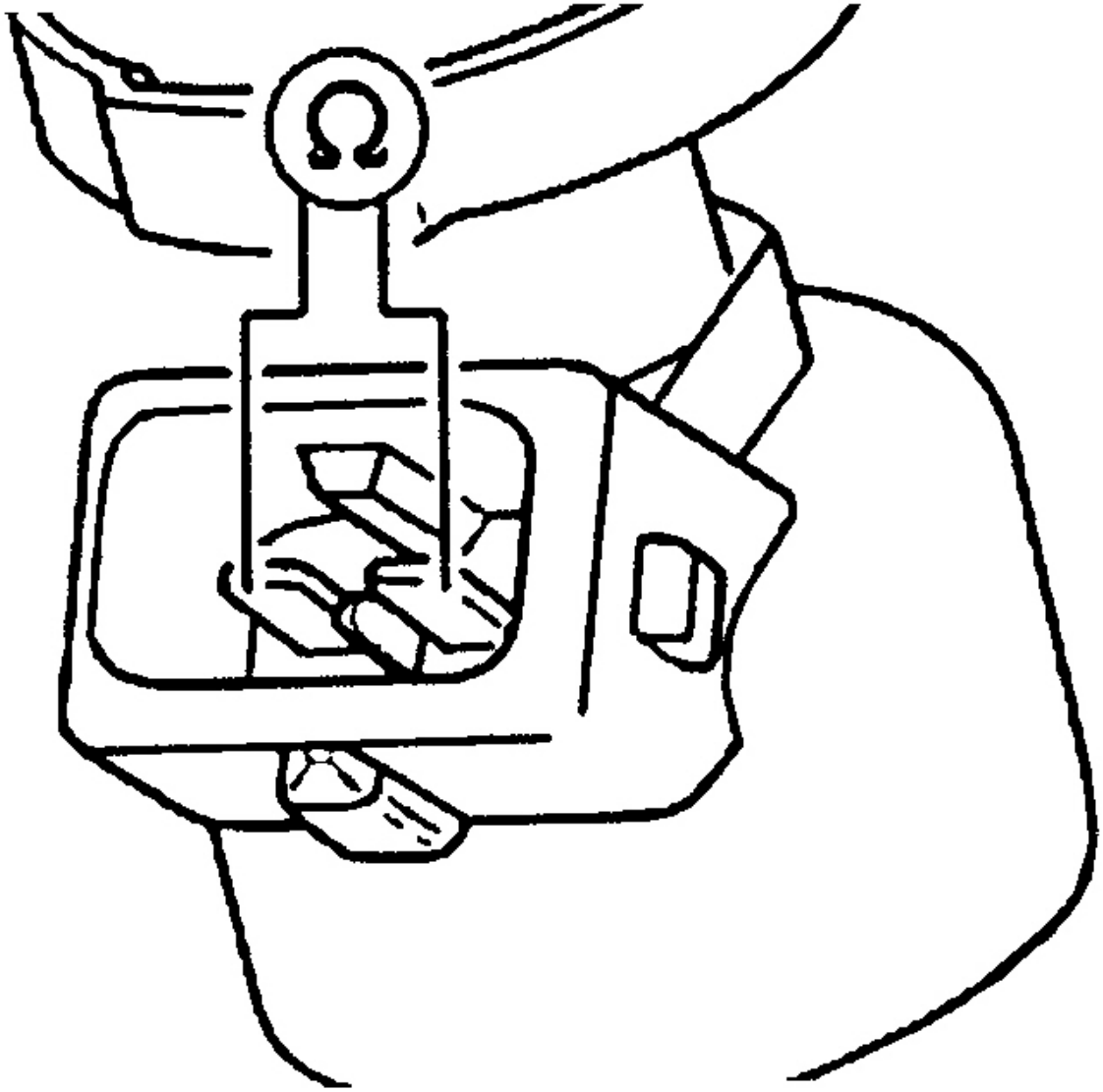
injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 8 .

6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 25** .

FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

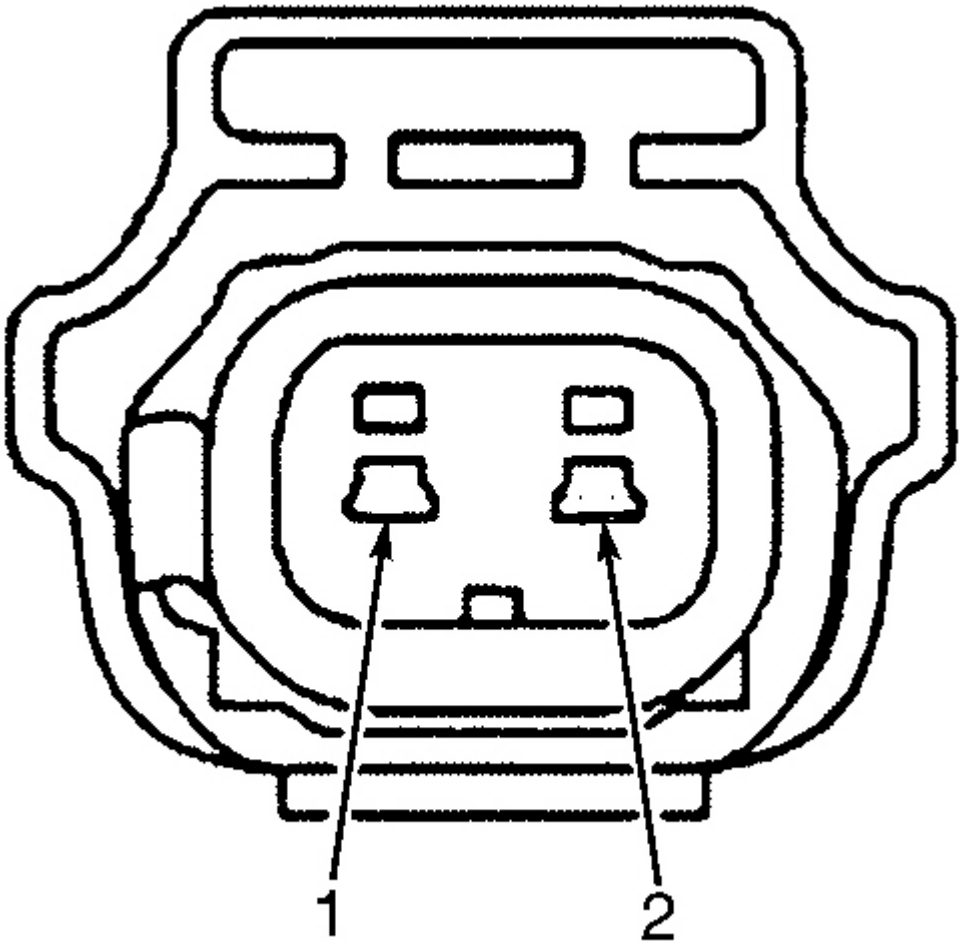
Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

7. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. See **ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083391

Fig. 24: Identifying Fuel Injector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083413

Fig. 25: Identifying Fuel Injector Harness Connector Terminals (Beetle, Golf, & Jetta - 2.0L)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0221/16605, P0222/16606 & P0223/16607: ANGLE SENSOR 2

NOTE: **If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

DTC P0221/16605
Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal

DTC P0222/16606
Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low

DTC P0223/16607
Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other.

Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-93 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool.

Test Procedure

NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 19** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive

Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188) at idle stop. Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 16 percent. Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 82 percent.

3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check accelerator pedal position sensors. See **DTC P0226/16610** . If accelerator pedal position sensors are not okay, go to next step. If accelerator pedal position sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
5. Replace accelerator pedal position sensors as necessary. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt accelerator pedal position sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets. See **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 20** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185) - IMPLAUSIBLE SIGNAL

Circuit/Component Description

Accelerator Pedal Position (APP) sensor No. 1 (G79) and APP sensor No. 2 (G185) are located together as one unit in pedal assembly. APP sensors sense the position of the accelerator pedal, not throttle position.

When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) communicate driver's intentions to ECM, fully independent of each other. Specification for APP sensor No. 1 (G79) is 12-96 percent (0.60-4.9 volts). APP Sensor No. 2 (G185) ranges from 4-50 percent (0.20-2.50 volts), the larger the throttle opening the higher the percentage (voltage) reading.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Test ranges for accelerator position sensors may not fully display on scan tool. Percentage (voltage) should always be twice as large for APP sensor No. 1 (G79) as the percentage (voltage) for APP sensor No. 2 (G185). No idle specifications for APP sensors are given by manufacturer.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading on APP sensors No. 1 (G79) and No. 2 (G185).
2. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for APP sensor No. 1 (G79) and APP sensor No. 2 (G185). Specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts). Specification for APP sensor No. 2 (G185) is 4 to 50 percent (0.20 to 2.50 volts). If percentage (voltage) is not okay, go to next step. If percentage (voltage) is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Remove drive's side footwell cover and trim as necessary. Disconnect APP sensors 6-pin harness connector. Turn ignition on. Check voltage supply at 6-pin harness connector. See **Fig. 26** . See **APP SENSOR VOLTAGE SPECIFICATIONS** table. Turn ignition off. If no voltage is present, go to next step. If voltage tests are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR VOLTAGE SPECIFICATIONS

APP Sensor Harness Connector Terminals	Voltage
1 & Ground	Minimum 4.5
1 & 5	Minimum 4.5

2 & Ground	Minimum 4.5
2 & 3	Minimum 4.5

4.

NOTE: If accelerator pedal assembly is replaced, APP sensors must be adapted to the A/T Control Module.

Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) or (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between APP sensor circuits and test box sockets. See **APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in APP sensor 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

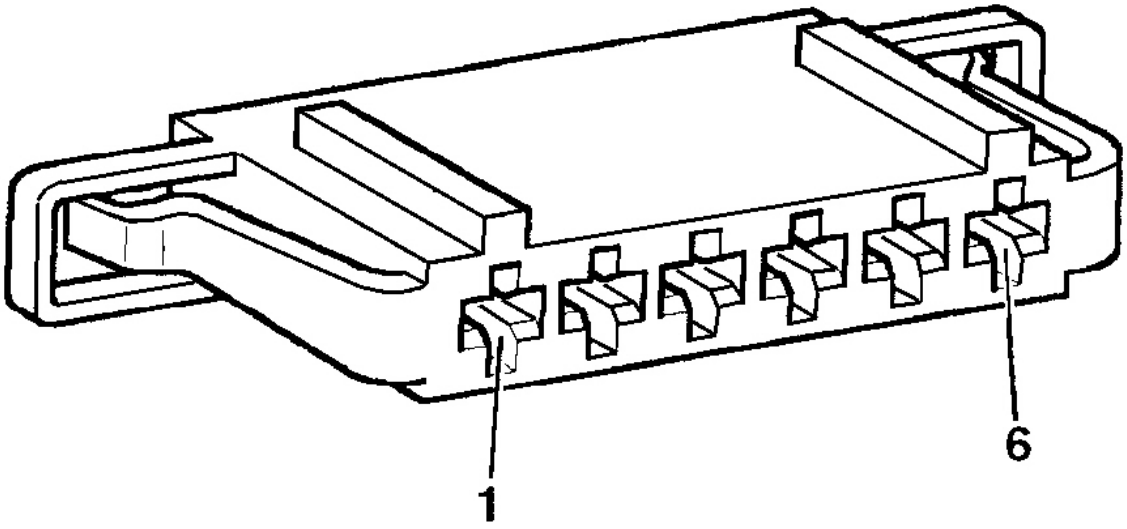
APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

APP Sensor 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	72
2	73
3	36
4	35
5	33
6	34

5.

NOTE: APP sensor harness connector terminal No. 5 is for A/T models only.

Replace faulty APP sensors No. 1 (G79) and No. 2 (G185). Accelerator position sensors are an integral part of the accelerator pedal assembly. After repairs, erase DTC memory. Adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073493

Fig. 26: Identifying Accelerator Pedal Position (APP) Sensor Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

DTC P0230/16614: FUEL PUMP RELAY (J17) - ELECTRICAL CIRCUIT MALFUNCTION

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Using DVOM, check power supply and ground to Fuel Pump Relay. See **Fig. 27** . See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.
2. Check resistance of Fuel Pump Relay wiring. Resistance should be a maximum of 1.5 ohms for each reading. Check Fuel Pump Relay wiring for short circuits to one another, and for short circuits to B+ and ground. See **Fig. 27** .
3. If resistance, voltage and ground supply are okay and no short circuits are present, replace faulty Fuel Pump Relay (J17). If resistance and/or voltage or ground supply are not okay or a short circuit is present, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

NOTE: Relay panel is behind trim panel, under driver's side of dash.

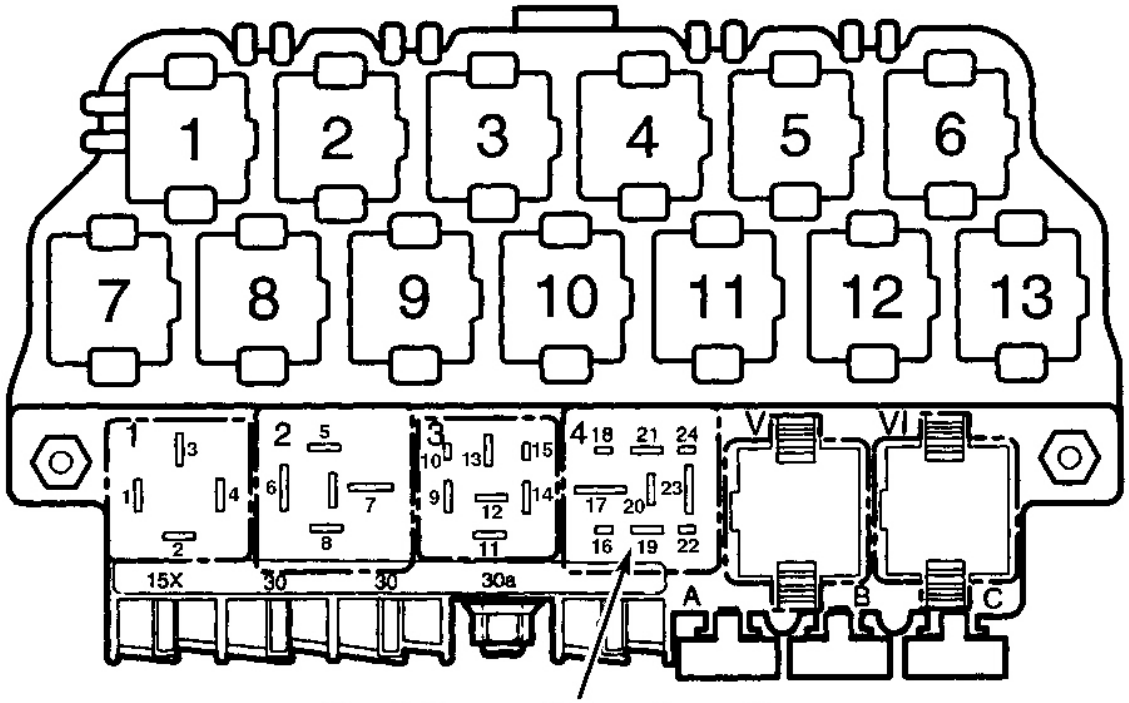


Fig. 27: Fuel Pump Relay Location (All Models)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0261/16645, P0262/16646, P0264/16648 & P0265/16649: FUEL INJECTOR SHORT TO GROUND OR POWER (NO. 1 OR NO. 2)

Code Definition

DTC P0261/16645
Injector Cylinder 1 (N30) - Short To Ground

DTC P0262/16646
Injector Cylinder 1 (N30) - Short To B+

DTC P0264/16648
Injector Cylinder 2 (N31) - Short To Ground

DTC P0265/16649
Injector Cylinder 2 (N31) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must

be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 24** . Resistance must be 14-18 ohms at room temperature, (resistance should be greater than 14-18 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors. Test light may not go out completely, but should dull and get brighter during activation.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 25** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .
4. Check resistance between terminal No. 1 of fuel injector harness connector that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using

DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 25** .

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0267/16651, P0268/16652, P0270/16654 & P0271/16655: FUEL INJECTOR SHORT TO GROUND OR POWER (NO. 3 OR NO. 4)

Code Definition

DTC P0267/16651
Injector Cylinder 3 (N32) - Short To Ground

DTC P0268/16652
Injector Cylinder 3 (N32) - Short To B+

DTC P0270/16654
Injector Cylinder 4 (N33) - Short To Ground

DTC P0271/16655
Injector Cylinder 4 (N33) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with

parking brake set.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 24** . Resistance must be 14-18 ohms at room temperature, (resistance should be greater than 14-18 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors. Test light may not go out completely, but should dull and get brighter during activation.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 25** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .
4. Check resistance between terminal No. 1 of fuel injector harness connector that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket.

See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 25** .

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0300/16684 & P0301/16685: MISFIRE RECOGNITION

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P0300/16684
Random/Multiple Cylinder Misfire Recognized

DTC P0301/16685
Misfire Cylinder No. 1

Test Requirements

Ensure vehicle has a sufficient amount of fuel. Ensure Camshaft Position (CMP) sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748** . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705** . Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

CAUTION: When checking misfires, it is essential to ensure fuel is not contaminated and that engine is mechanically sound (e.g. compression is okay).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

1. Turn ignition off. Remove and check condition of ignition wire and spark plug at misfiring cylinder. Ignition wire w/spark plug connector should have 4000-8000 ohms of resistance. If ignition wire is not okay, replace ignition wire set. Check spark plug for correct heat range. If spark plug(s) are okay, go to next step. If spark plug(s) are not okay, replace spark plugs as a set. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Using DVOM, check supply voltage between terminals No. 1 and 6. See **Fig. 29** . Voltage should a minimum of 11.5 volts, (battery voltage). If voltage is okay, go to step 4 . If voltage is not okay, go to next step.
3. Using DVOM, check wiring for open circuit between ignition coil harness connector terminal No. 6 and power supply relay using wiring diagram. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 29** . Check wiring for open circuit between ignition coil harness connector terminal No. 1 and ground. See **Fig. 29** . Resistance reading should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If any resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Using scan tool, check fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . Fuel injectors should audibly click. If all fuel injectors click, go to next step. If any fuel injector does not click, repair as necessary. See **DTC P0267/16651, DTC P0268/16652, DTC P0270/16654 & DTC P0271/16655** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. **WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.**

   Remove fuse No. 32 (disables fuel injectors). Using LED test light, check voltage supply to ignition coil of cylinder indicated to be misfiring. See **IGNITION COIL HARNESS CONNECTOR VOLTAGE TEST POINTS IDENTIFICATION** table. Disconnect ignition coil harness connector. See **Fig. 28** . Have a second person crank engine. LED should flash. Turn ignition off. If LED did not flash (no voltage is present), go to next step. If LED flashed (voltage readings are okay) and voltage is present between terminals No. 1 and 6, replace faulty ignition coil w/output stage. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IGNITION COIL HARNESS CONNECTOR VOLTAGE TEST POINTS IDENTIFICATION

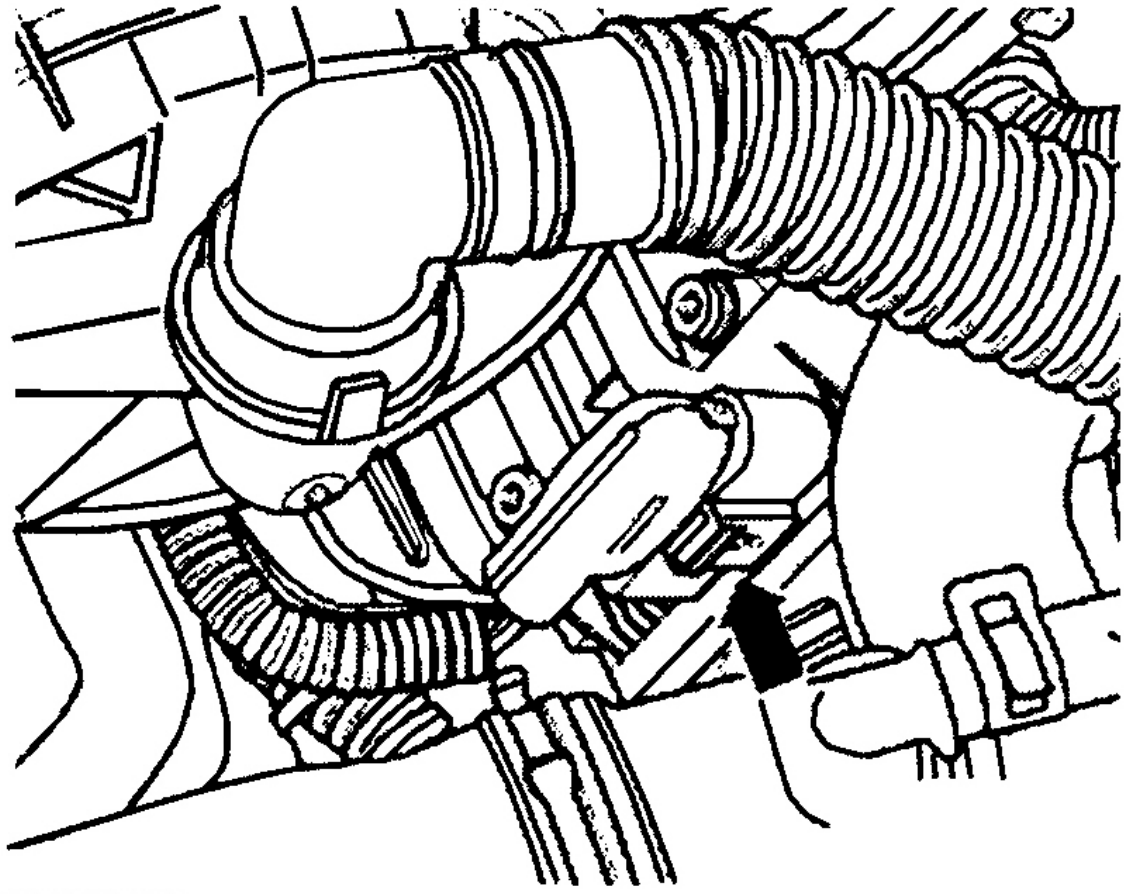
Cylinder	Ignition Coil Harness Connector Terminals
1	1 & 2
2	1 & 3
3	1 & 4
4	1 & 5

6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 29** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

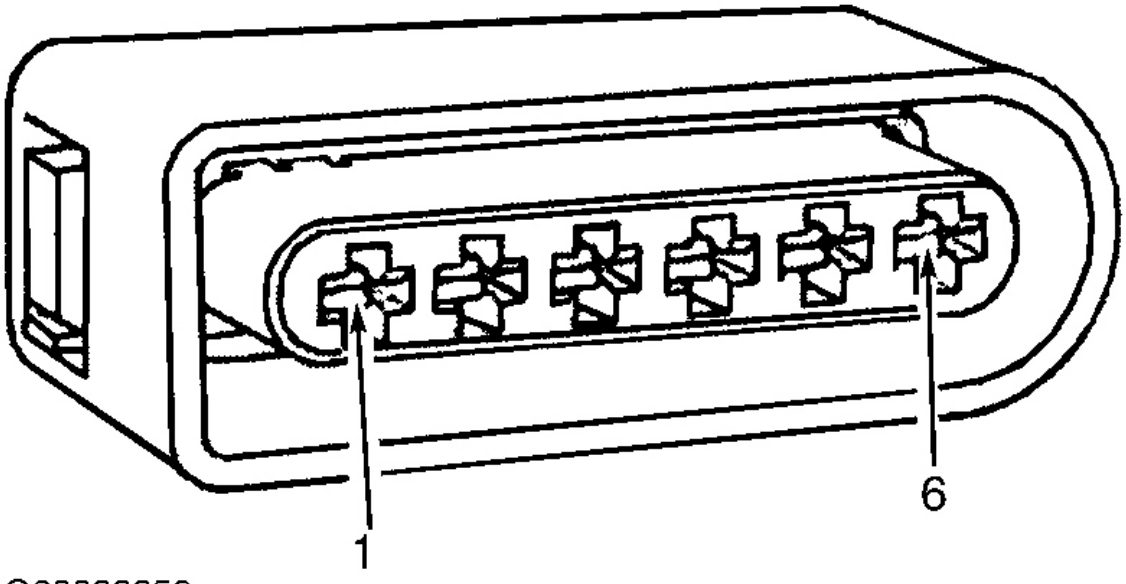
Cylinder	Ignition Coil Harness Connector Terminal	VAG Test Box Socket
1	2	102
2	3	95
3	4	103
4	5	94

7. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083255

Fig. 28: Locating Ignition Coil/Output Stage Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083256

Fig. 29: Identifying Test Points On Ignition Coil/Output Stage Harness Connector

Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0321/16705: ENGINE SPEED SENSOR (RPM - G28) - IMPLAUSIBLE SIGNAL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine Speed (RPM) Sensor (G28) is a speed and reference sensor. If Engine Speed sensor does not send a signal, engine will not start. If Engine Speed sensor fails when engine is running, engine will stall.

Test Requirement

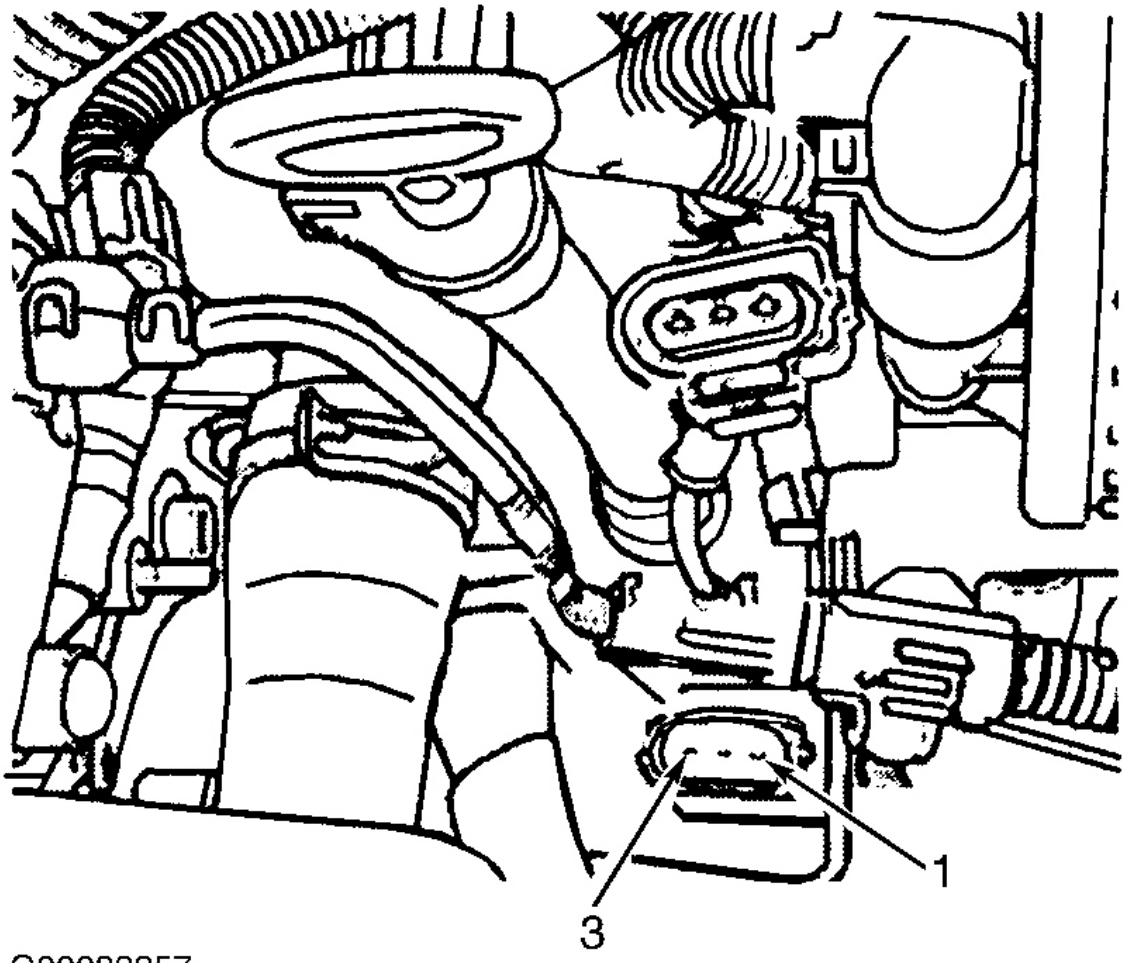
Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Disconnect grey 3-pin harness connector from Engine Speed Sensor (G28). See **Fig. 30** . Using DVOM measure resistance between terminals No. 2 and 3 of Engine Speed sensor. See **Fig. 31** . Resistance should be 730-1000 ohms. Check for short circuit between Engine Speed sensor terminals No. 1 and 2. Check for short circuit between Engine Speed sensor terminals No. 1 and 3. If readings are okay, go to next step. If readings are not okay, replace faulty Engine Speed sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following Engine Speed sensor 3-pin harness connector terminals and test box sockets. See **Fig. 32** .
   - Engine Speed sensor 3-pin harness connector terminal No. 1 and test box socket No. 108.
   - Engine Speed sensor 3-pin harness connector terminal No. 2 and test box socket No. 90.
   - Engine Speed sensor 3-pin harness connector terminal No. 3 and test box socket No. 82.

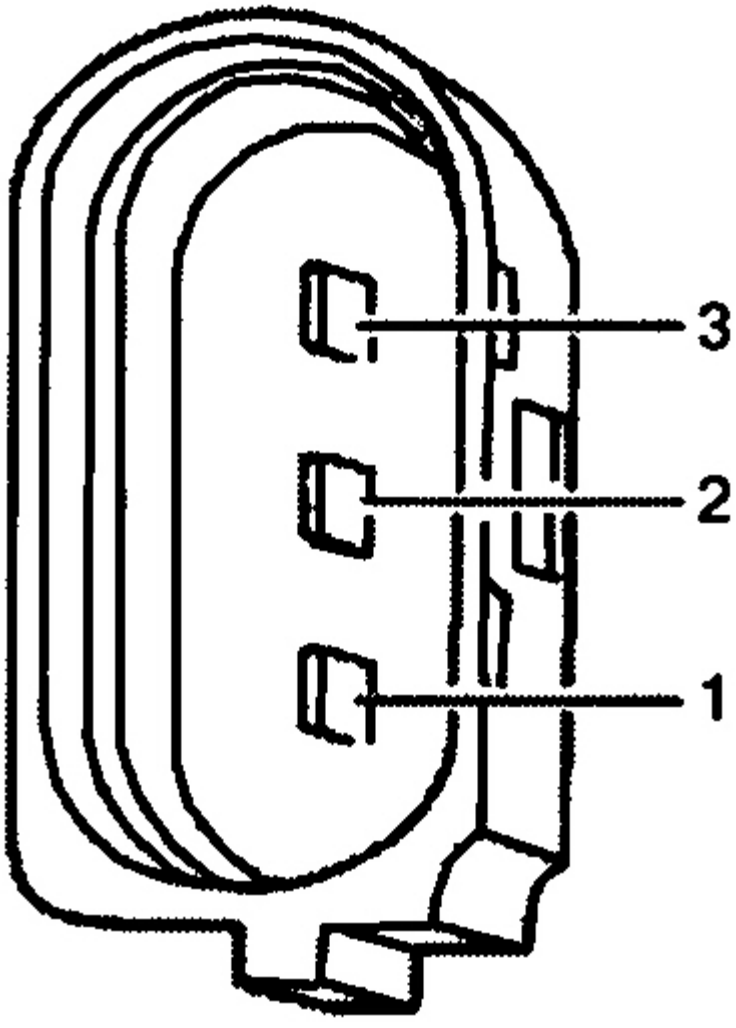
   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in Engine Speed sensor 3-pin harness connector for short circuits to one another. If resistance is okay and no short circuits are present, go to next step. If resistance is not okay or short circuit exists, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: There is a gap in sensor wheel. This gap is the reference mark.**

Remove Engine Speed sensor. Ensure Engine Speed sensor wheel is secure on sensor shaft. Check Engine Speed sensor for excessive runout and damage. Repair or replace as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If Engine Speed sensor harness connector circuits are okay, and Engine Speed sensor is okay, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083257

Fig. 30: Locating Engine Speed Sensor (RPM - G28)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083371

Fig. 31: Identifying Engine Speed Sensor Test Points
Courtesy of VOLKSWAGEN UNITED STATES, INC.

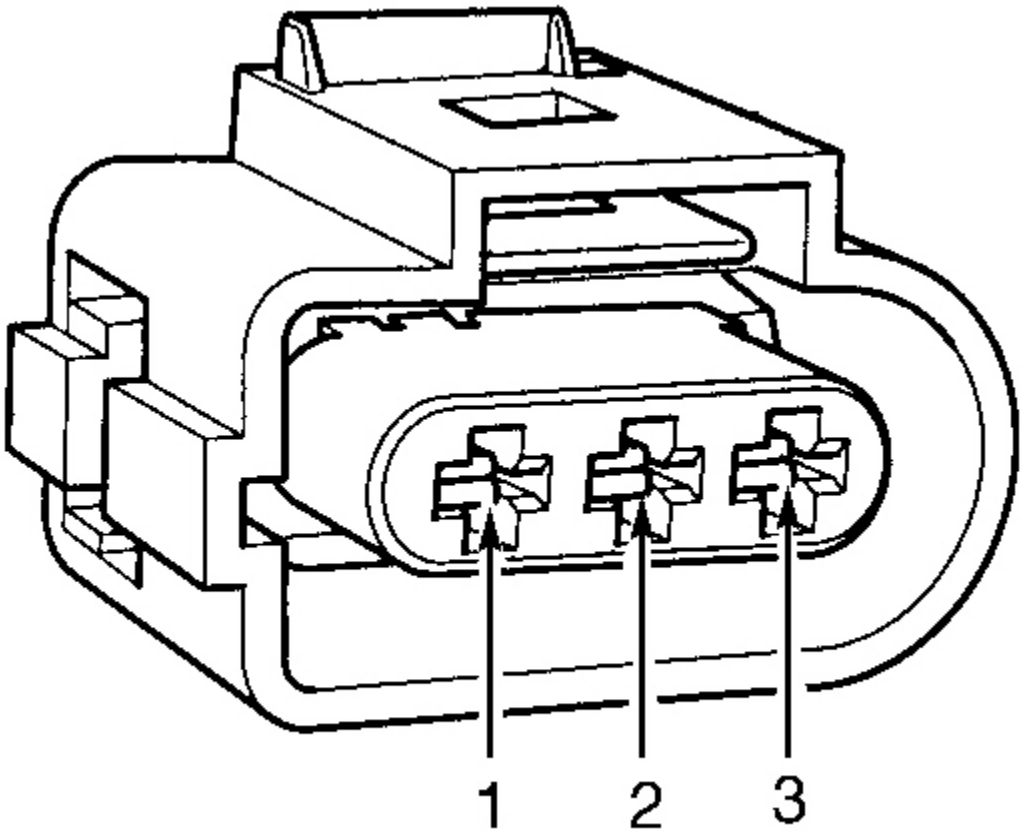


Fig. 32: Identifying Test Points On 3-Pin Connector
Courtesy of VOLKSWAGON UNITED STATES, INC.

DTC P0324/16708, P0327/16711, P0328/16712, P0332/16716 & P0333/16717: KNOCK SENSOR SIGNAL

Code Definition

DTC P0324/16708
Knock Sensor - Malfunction

DTC P0327/16711
Knock Sensor 1 (G61) - Signal Too Low

DTC P0328/16712
Knock Sensor 1 (G61) - Signal Too High

DTC P0332/16716
Knock Sensor 2 (G66) - Signal Too Low

DTC P0333/16717
Knock Sensor 2 (G66) - Signal Too High

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

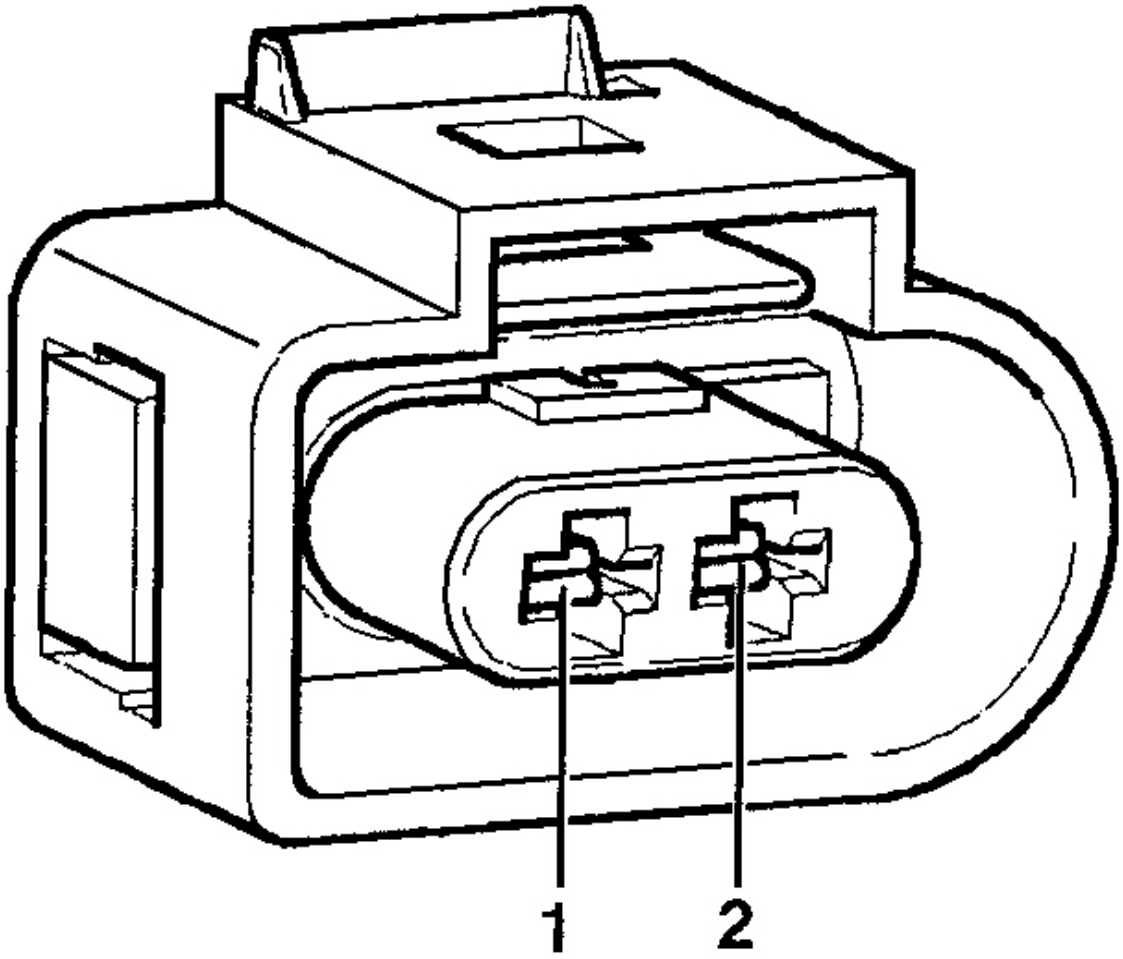
NOTE: It is extremely important that knock sensors are tightened to 15 ft. lbs.(20 Nm), to ensure knock sensors perform perfectly. Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.

1. Turn ignition off. Disconnect knock sensor No. 1 and 2 harness connectors. Check resistance between contacts at each knock sensor, resistance should be infinite (no continuity). If no continuity is present in resistance reading, go to next step. If continuity is present in resistance reading, replace faulty knock sensor(s). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Turn ignition off. Loosen and retighten knock sensors No. 1 and 2 to 15 ft. lbs. (20 N.m). Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following knock sensor harness connectors and VAG test box sockets. Check wiring for short circuit to one another in knock sensor No. 1 (G61) harness connector. Check wiring for short circuit to one another in Knock sensor No. 2 (G66) harness connector. See **KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 33** . Resistance should be a maximum of 1.5 ohms for each reading. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Knock Sensor Harness Connector Terminal	VAG Test Box Socket
Knock Sensor No. 1 (G61 - Cylinders 1 & 2)	
1 (Signal)	106
2 (Ground)	99
Knock Sensor No. 2 (G66 - Cylinders 3 & 4)	
1 (Signal)	107
2 (Ground)	99

4. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) reset, replace faulty knock sensor(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073508

Fig. 33: Identifying Knock Sensor Harness Connector Test Points
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0341/16725: CAMSHAFT POSITION SENSOR (G163) - IMPLAUSIBLE SIGNAL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirement

NOTE: Manufacturer's alpha-numeric identification for CMP sensor is G40.

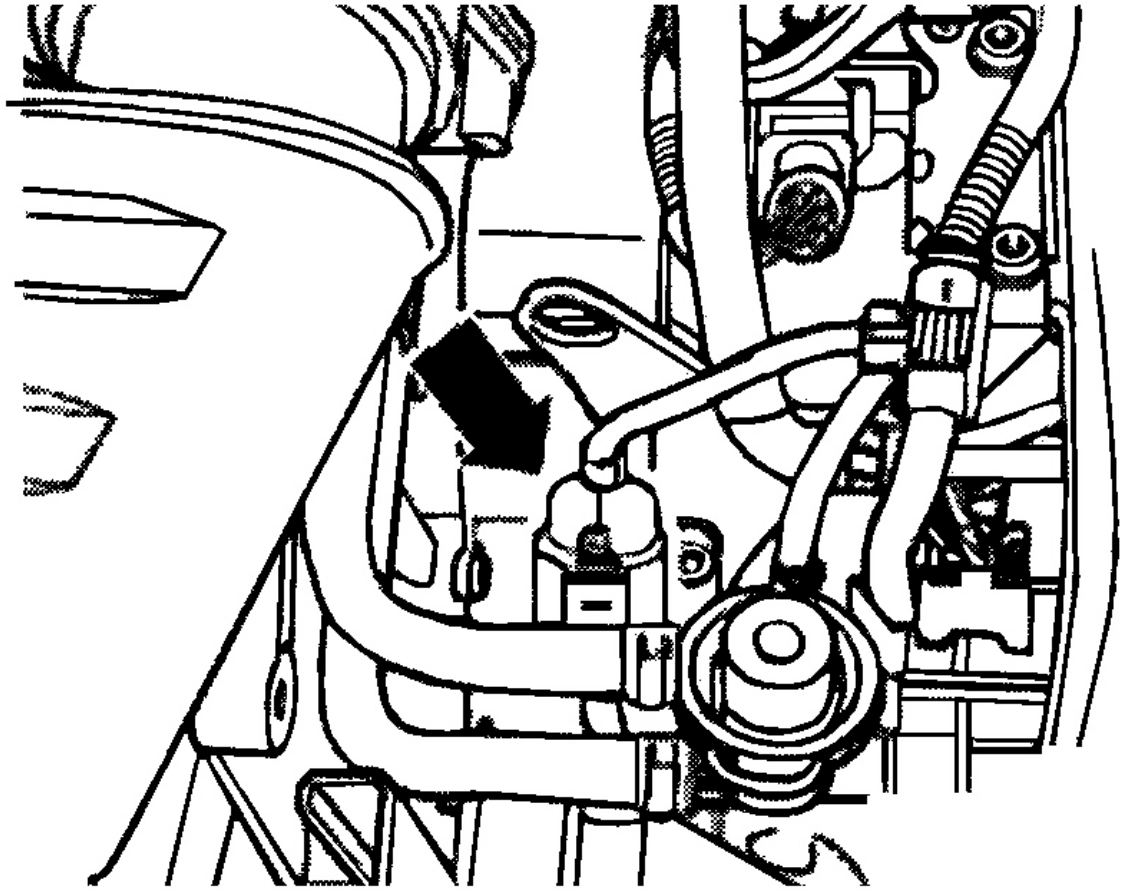
Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). Ensure Camshaft Position (CMP) sensor

is bolted on tightly. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Disconnect CMP sensor 3-pin harness connector. See **Fig. 34** . Turn ignition on. Using DVOM measure voltage between terminals No. 1 and 3 of CMP sensor 3-pin harness connector. See **Fig. 32** . Voltage should be a minimum of 4.0-6.0 volts. Turn ignition off. If readings are okay, go to next step (additional testing is needed). If readings are not okay, go to next step.
2. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following CMP sensor harness connector terminals and test box sockets. See **Fig. 32** .
   - CMP sensor harness connector terminal No. 1 and test box socket No. 98.
   - CMP sensor harness connector terminal No. 2 and test box socket No. 86.
   - CMP sensor harness connector terminal No. 3 and test box socket No. 108.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in CMP sensor 3-pin harness connector for short circuits to one another.
3. If CMP sensor harness connector circuits are okay and 4.0 to 6.0 volts are present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace faulty CMP sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If CMP sensor harness connector circuits are okay, but no voltage is present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083414

Fig. 34: Locating CMP Sensor Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0351/16735, P0352/16736, P0353/16737 & P0354/16738: IGNITION COIL CONTROL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P0351/16735
Ignition Control Cylinder 1 - Malfunction

DTC P0352/16736
Ignition Control Cylinder 2 - Malfunction

DTC P0353/16737

Ignition Control Cylinder 3 - Malfunction

DTC P0354/16738
Ignition Control Cylinder 4 - Malfunction

Test Requirements

Ensure Camshaft Position sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748** . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705 & DTC P0322/16706** . Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Turn ignition off. Remove and check condition of ignition wire and spark plug at misfiring cylinder. Ignition wire w/spark plug connector should have 4000-8000 ohms of resistance. If ignition wire is not okay, replace ignition wire set. Check spark plug for correct heat range. If spark plug(s) are okay, go to next step. If spark plug(s) are not okay, replace spark plugs as a set. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Using DVOM, check supply voltage between terminals No. 1 and 6. See **Fig. 29** . Voltage should a minimum of 11.5 volts, (battery voltage). If voltage is okay, go to step 4 . If voltage is not okay, go to next step.
3. Using DVOM, check wiring for open circuit between ignition coil harness connector terminal No. 6 and power supply relay using wiring diagram. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and **Fig. 29** . Check wiring for open circuit between ignition coil harness connector terminal No. 1 and ground. Resistance reading should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If any resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. **WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.**

   Remove fuse No. 32 (disables fuel injectors). Using LED test light, check voltage supply to ignition coil of cylinder indicated to be misfiring. See **IGNITION COIL HARNESS CONNECTOR VOLTAGE TEST POINTS IDENTIFICATION** table. Disconnect ignition coil harness connector. See **Fig. 28** . Have a second person crank engine. LED should flash. Turn ignition off. If LED did not flash (no voltage is present), go to next step. If LED flashed (voltage readings are okay) and voltage is present between terminals No. 1 and 6, replace faulty ignition coil w/output stage. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect

Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 29** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0420/16804: CATALYST SYSTEM - EFFICIENCY BELOW THRESHOLD

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. Check air filter for blockage. If no air leaks are found and air intake is unrestricted, go to next step. If air leaks are found and/or air intake is restricted. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. Check control of upstream TWC HO2S. See **DTC P0170/16554, DTC P0171/16555 & DTC P0172/16556** . If control of upstream TWC HO2S is okay, go to next step. If control of upstream TWC HO2S is not okay, repair wiring or replace upstream TWC HO2S as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Check control of downstream TWC HO2S. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If control of downstream TWC HO2S is okay, go to next step. If control of downstream TWC HO2S is not okay, repair wiring or replace downstream TWC HO2S as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Check aging of upstream TWC HO2S. See **DTC P0133/16517 & DTC P0134/16518** . If aging of upstream TWC HO2S is okay, go to next step. If aging of upstream TWC HO2S is not okay, repair wiring or replace upstream TWC HO2S as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6.

NOTE: Catalytic converter must be 662-932°F (350-500°C) to for scan tool to check catalytic convertor.

Follow scan tool manufacturer's instructions, for checking catalytic converter. If catalytic converter is not okay, replace faulty catalytic converter. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If catalytic converter is okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC P0420/16804 or DTC P0422/16806 do not reset after test drive, test is complete.

DTC P0441/16825: EVAP SYSTEM - FLOW RATE MALFUNCTION

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

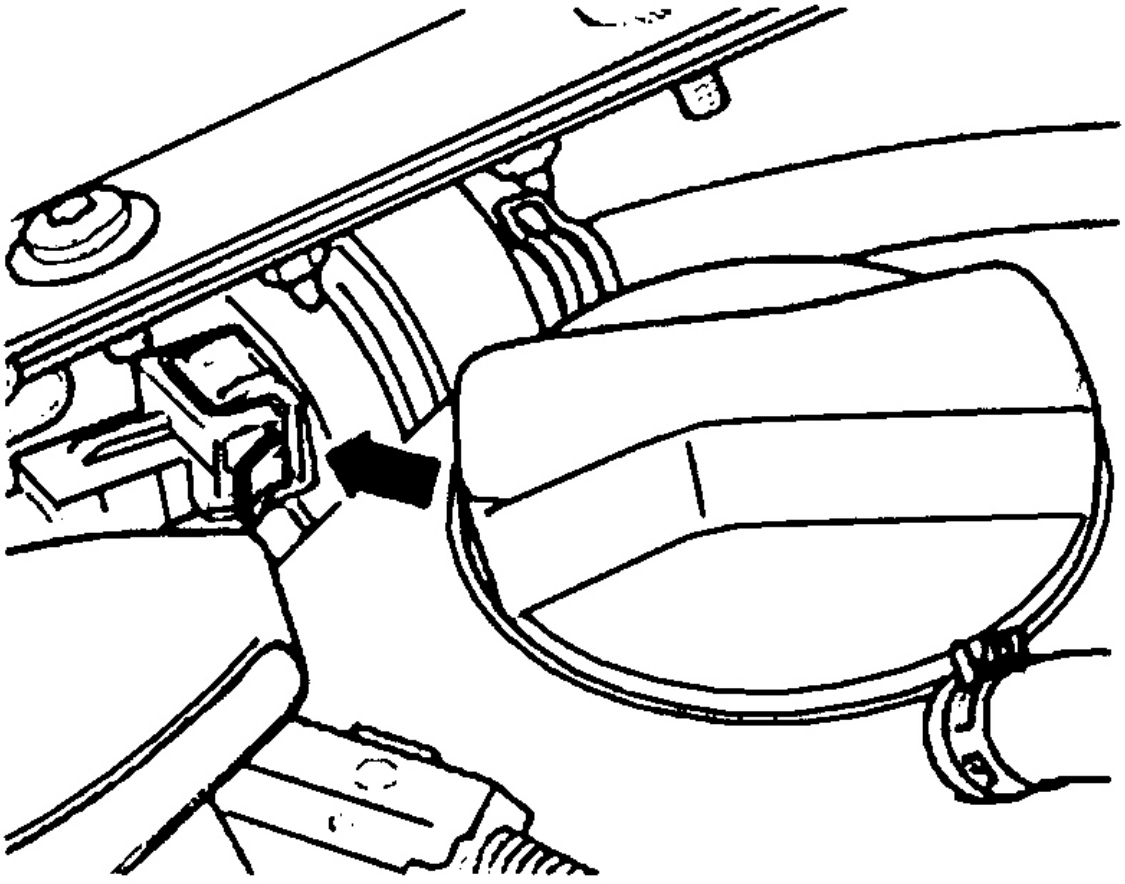
Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Canister Purge Valve (N80) should audibly click. EVAP Canister Purge Valve (N80) is located in engine compartment, center of right side fender. See **Fig. 35** and **Fig. 36** . If EVAP Canister Purge Valve (N80) clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If EVAP Canister Purge Valve (N80) does not click or DTC P0440/16824 or P0441/16825 resets, go to next step.
3. Turn ignition off. Disconnect harness connector from EVAP Canister Purge Valve (N80). Connect LED test light to both terminals of EVAP canister purge valve harness connector. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash. If test light does not flash, go to next step. If test light flashes, replace faulty EVAP Canister Purge Valve (N80). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn

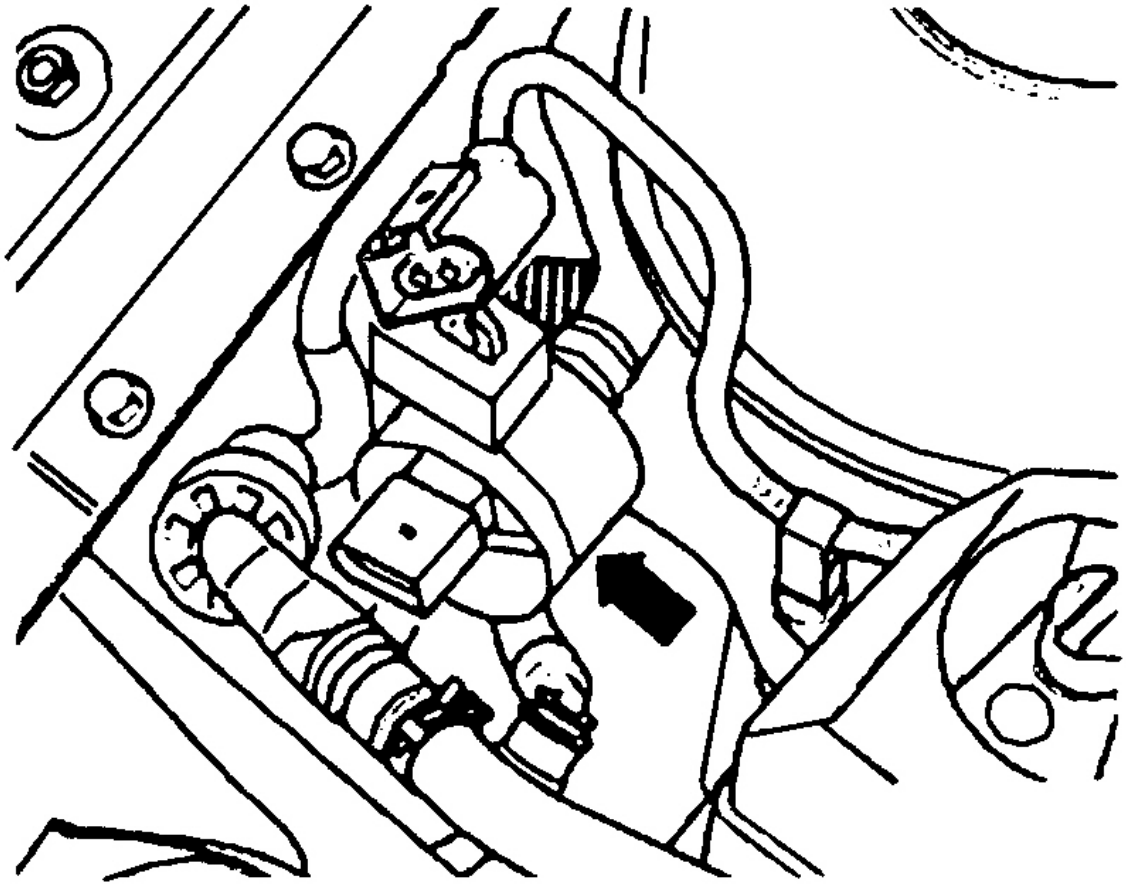
procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. Turn ignition off. Using DVOM check resistance of EVAP Canister Purge Valve (N80) harness connector wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in harness connector for short circuits to one another and to ground and B+.
5. If resistance is okay and no shot circuits are present, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083403

Fig. 35: Locating EVAP Canister Purge Valve (N80 - Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083404

Fig. 36: Locating EVAP Canister Purge Valve (N80 - Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0442/16827, P0455/16839 & P0456/16840: EVAP LEAK

NOTE: **If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

DTC P0442/16827
EVAP - Small Leak Detected

DTC P0455/16839
EVAP - Very Large Leak Detected

DTC P0456/16840
EVAP - Very Small Leak Detected

Test Requirements

Ensure intake air temperature is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C). Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions, check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If DTC returns on test drive, go to next step.
3. Check EVAP Canister Purge Valve (N80). See **DTC P0441/16825** .
4. Check EVAP Leak Detection Pump (V144) using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals (cycle on and off). If EVAP Leak Detection Pump (V144) does not run, go to next step.
5. Disconnect EVAP Leak Detection Pump (V144) harness connector, install LED test light at EVAP leak detection pump harness connector terminal No. 2 and B+. See **Fig. 37** . Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . Turn ignition off. Install LED test light at EVAP leak detection pump harness connector terminal No. 3 and Ground. Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash during each test. If LED test light does not flash during each test, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes during each test, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 37** .
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17).

   Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1 and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.
7. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

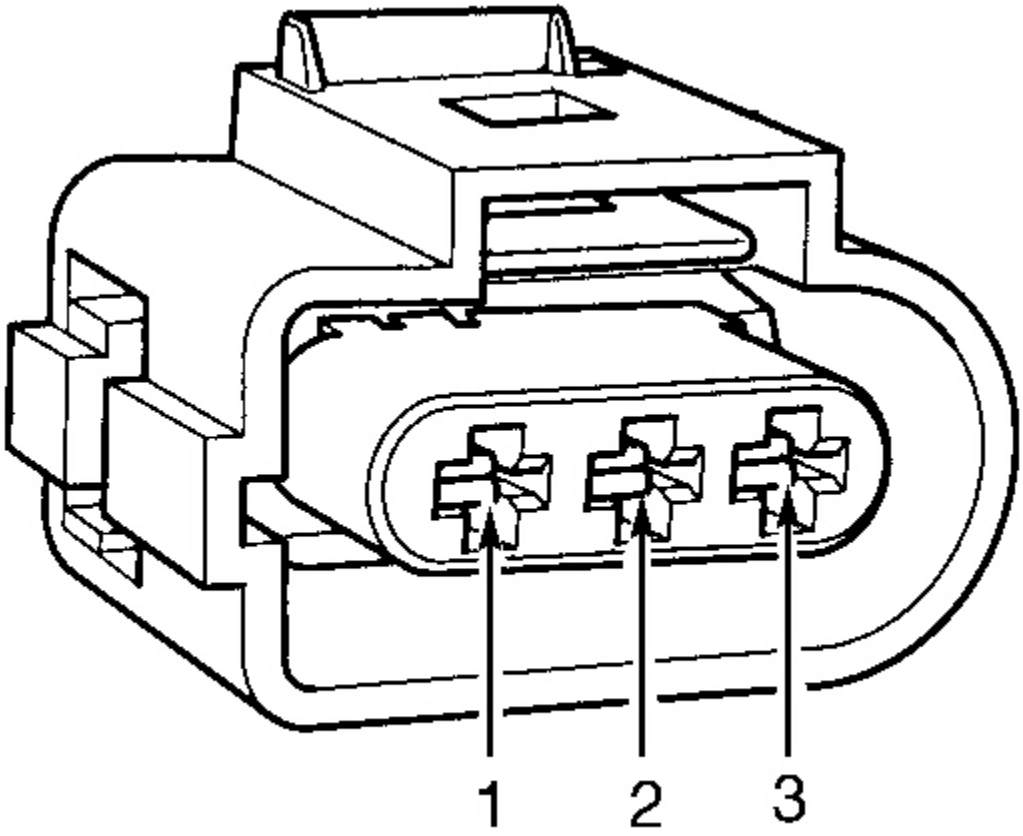


Fig. 37: Identifying EVAP Leak Detection Pump (V144) Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

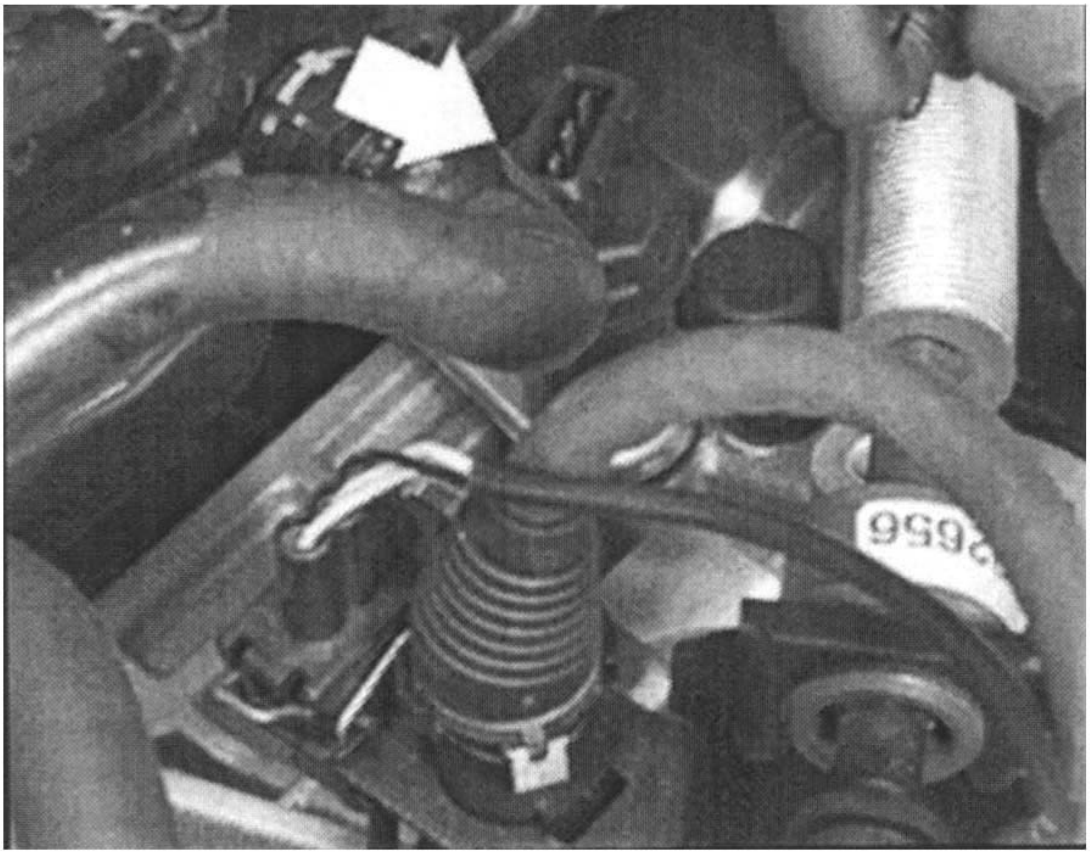
DTC P0501/16885: VEHICLE SPEED SIGNAL - IMPLAUSIBLE SIGNAL

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C).

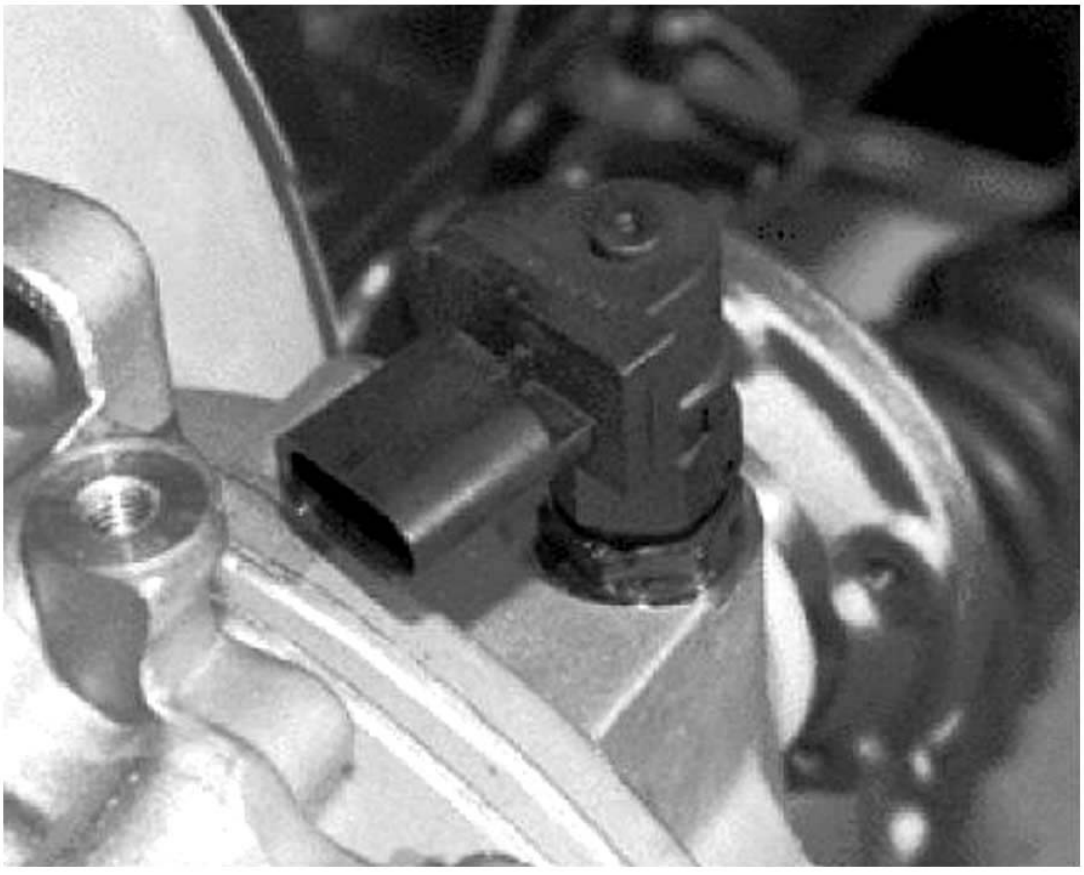
Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check vehicle speed signal. Vehicle must be test driven to check speed signal. With help from a second person in the back seat to read scan tool, observe scan tool display. Scan tool display should be approximately driven speed. If no speed is displayed on scan tool, go to next step. If scan tool and speedometer displays approximately driven speed. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC P0501/16885 did not return on test drive, test is complete.
2. Turn ignition off. Disconnect Engine Control Module (ECM) harness connector. Connect Test Box (VAG 1598/31) to ECM harness connector, leave ECM disconnected. See **CONNECTING VAG TEST BOX** . Raise one front wheel off the ground. Turn ignition on, engine off. Measure voltage between terminals No. 3 and 54 at test box while rotating front wheel. Voltage should fluctuate between zero and 4 volts. If voltage does not fluctuate, check Vehicle Speed sensor (G22) wiring for open and short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.
3. If wiring is okay, replace faulty Vehicle Speed sensor (G22). With A/T see **Fig. 38** . With M/T see **Fig. 39** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring is not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083396

Fig. 38: Locating Vehicle Speed Sensor (G22), On Top Of Differential Housing (A/T)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083258

Fig. 39: Locating Vehicle Speed Sensor (G22), On Top Of Differential Housing (M/T)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0506/16890 & P0507/16891: IDLE SPEED CONTROL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P0506/16890
Idle Speed Control - RPM Too Low

DTC P050716891
Idle Speed Control - RPM Too High

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent.

Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool.

Test Procedure

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 19** . Specification is 1-5 ohms.
2. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T Control Module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188) at idle stop. Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-16 percent. Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-82 percent.
4. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-93 percent (0.15-4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-3 percent (4.90-0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 7 . If throttle valve drive angle sensor tests

are okay, go to next step.

5. Check Accelerator Pedal Position (APP) sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
6. Replace APP sensors as necessary. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets. See **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 20** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0513/16897: IMMOBILIZER - INCORRECT CODE

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C).

Immobilizer Adaptation To ECM (J220)

NOTE: Manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052.

Starting with Model Year 2002, Golf and Jetta are equipped with Immobilizer Generation III (Starting 6/2001 for Beetle). Ignition keys for Immobilizer III may be marked "W3". Scan Tool VAS 5051 or 5052 must be used for Immobilizer Generation III diagnoses and coding. A correct Importer/Dealer number must reside in VAS 5051 or VAS 5052 in order to request a PIN number and to adapt Immobilizer Generation III.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Instrument Cluster Control Module (J285) for immobilizer DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary, verify repair erase DTC memory, go to next step.
2. **NOTE: Identity of ECM is read into the immobilizer control module next time ignition is switched on.**

   Adapt immobilizer to ECM. Authorized vehicle key required. Switch ignition on. Follow scan tool manufacturer's instructions for immobilizer adaptation to ECM, turn ignition off, turn ignition back on within 60 seconds. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0568/16952: CRUISE CONTROL SYSTEM SWITCH (E45) - IMPLAUSIBLE SIGNAL

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check cruise control system for DTCs and proper operation. Repair as necessary. Check wiring for open and short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0571/16955: BRAKE LIGHT SWITCH (F) - IMPLAUSIBLE SIGNAL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: OBD system monitors both Brake Light Switch (F) and Brake Pedal Switch (F47).

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Brake Light Switch (F) for DTCs. See appropriate ANTI-LOCK BRAKE article in BRAKES. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check Brake Light Switch (F). Remove trim to access brake light switch. Disconnect brake light switch harness connector. Using DVOM check resistance at brake light switch contacts 1 and 4. See **Fig. 40** . Resistance should be infinite (open circuit). Depress brake pedal, resistance should be approximately zero ohms (closed circuit).
3. Check resistance at brake light switch contacts 2 and 3, resistance should be approximately zero ohms (closed circuit). Depress brake pedal, resistance should be infinite (open circuit). If Brake Light Switch (F) is okay, go to next step. If Brake Light Switch (F) is not okay, replace faulty Brake Light Switch (F). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Using DVOM check Brake Light Switch (F) harness connector wiring resistance. See **Fig. 41** and ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms for each reading. Check Brake Light Switch (F) harness connector wiring for short circuit to one another, short circuit to ground, and short circuit to B+. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. If Brake Light Switch (F) is okay and wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

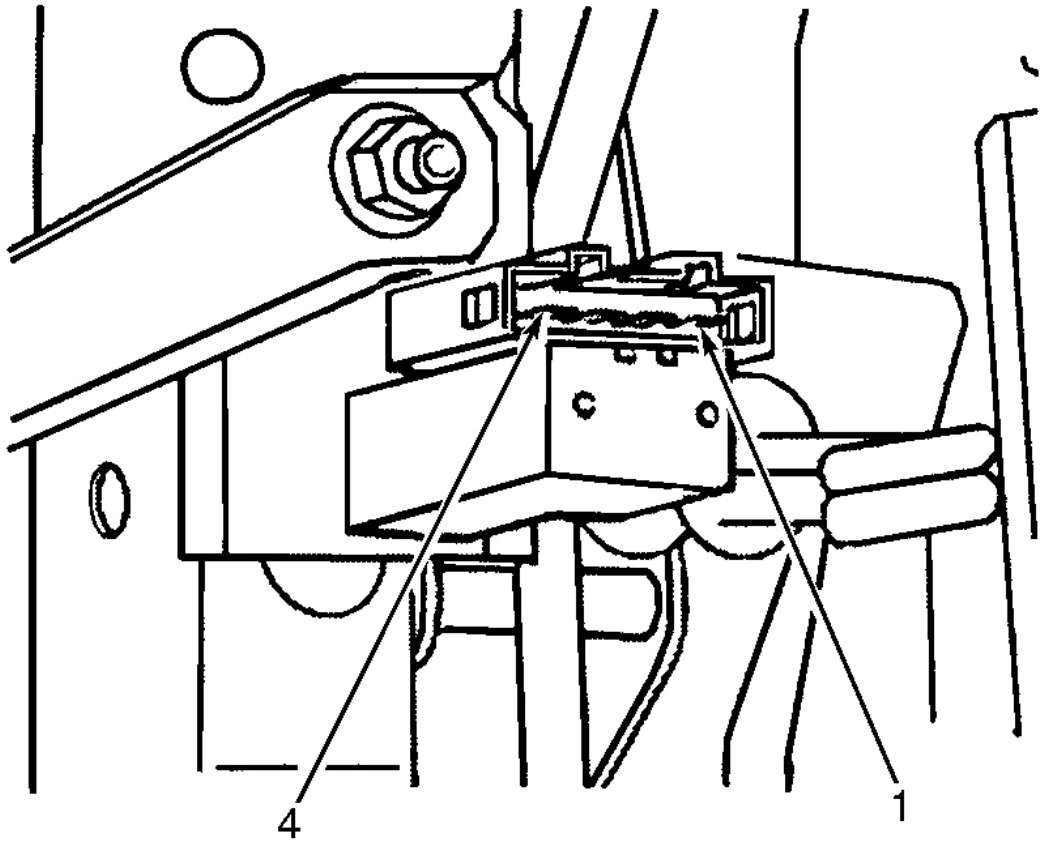


Fig. 40: Identifying Test Points On Brake Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

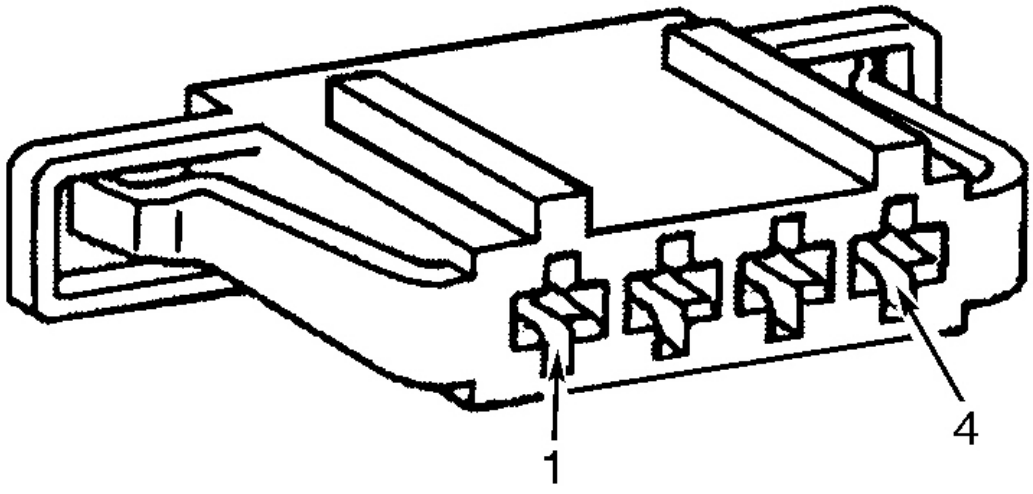


Fig. 41: Identifying Test Points On Brake Switch Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0600/16984: DRIVETRAIN DATA BUS - MISSING SIGNAL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

Test Requirements

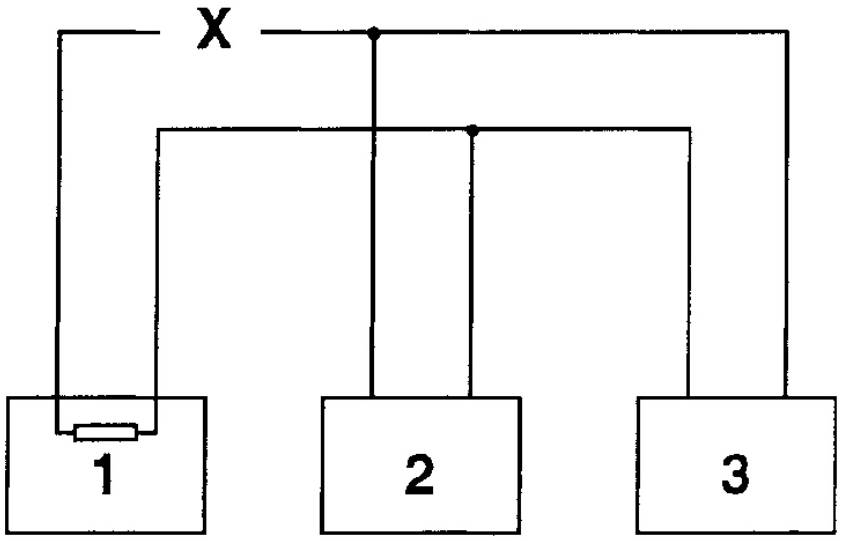
Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is

replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Transmission Control Module (J217) and ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Transmission Control Module (J217), ABS Control Module (J104) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

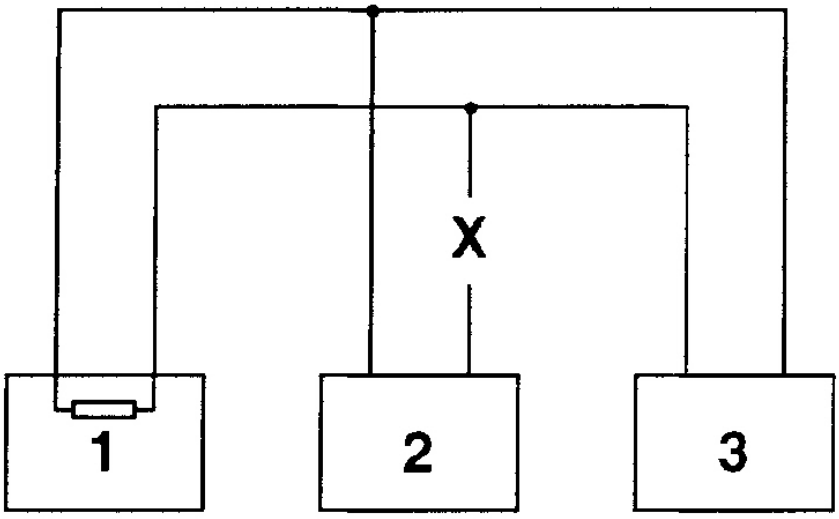


Example 1:

Control module	DTCs stored in DTC memories:
1	◆ Missing signal from control module 2 ◆ Missing signal from control module 3
2	◆ Missing signal from control module 1
3	◆ Missing signal from control module 1

G00077136

Fig. 42: Example 1: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.

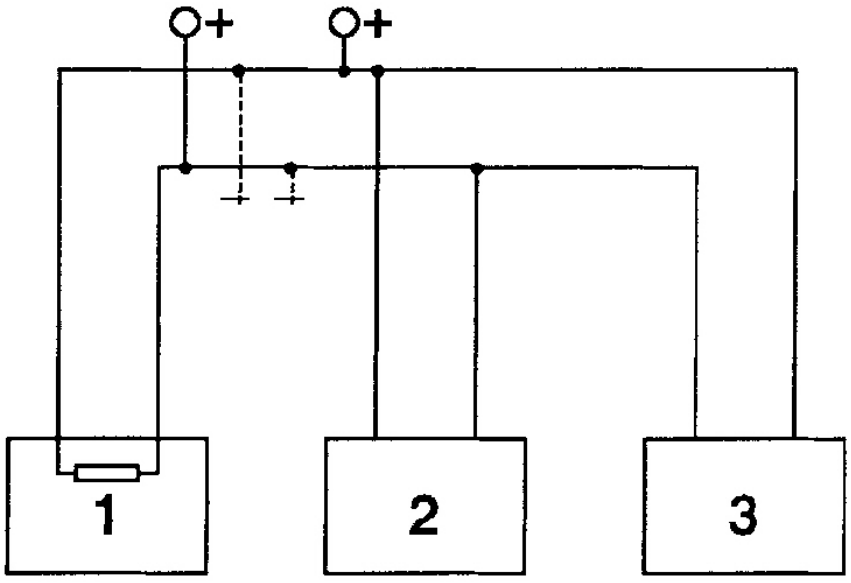


Example 2:

Control module	DTCs stored in DTC memories:
1	◆ Missing signal from control module 2
2	◆ Missing signal from control module 1 ◆ Missing signal from control module 3
3	◆ Missing signal from control module 2

G00077140

Fig. 43: Example 2: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.



Example 3:

Control module	DTCs stored in DTC memories:
1	◆ Powertrain CAN-bus faulty
2	◆ Powertrain CAN-bus faulty
3	◆ Powertrain CAN-bus faulty

G00077144

Fig. 44: Example 3: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.

DTC P0601/16985, P0602/16986, P0604/16988, P0605/16989 & P0606/16990: ECM MALFUNCTION

NOTE: **DTC P0601/16985, DTC P0602/16986, DTC P0604/16988 and DTC P0606/16990 may set if battery voltage (ECM voltage supply) is too low when vehicle is being started.**

Code Definition

DTC P0601/16985
ECM (J220) - Malfunction

DTC P0602/16986
ECM (J220) - Programing Malfunction

DTC P0604/16988
ECM (J220) - Malfunction

DTC P0605/16989
ECM (J220) - Malfunction

DTC P0606/16990
ECM (J220) - Malfunction

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below.

    - **Beetle**
      Turn ignition off. Move center dash panel forward and up. See **Fig. 5** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **Golf & Jetta**
      Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.
4. After installing ECM perform following procedures:
    - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
    - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL**

MODULE (J338) .

- On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
- On vehicles equipped with A/T, perform adaptation of A/T to its Basic Setting. See **A/T BASIC SETTING** .
- On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
- On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER ADAPTATION TO ECM (J220)** .
- Perform idle check. See **IDLE CHECK** .
- Generate ECM readiness code. See **READINESS CODE** .

P0638/17022: THROTTLE VALVE CONTROL MODULE (J338) - IMPLAUSIBLE SIGNAL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors.

Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool.

NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control

module (if equipped).

Test Procedure

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 19** . Specification is 1-5 ohms.
2. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T Control Module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188) at idle stop. Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-16 percent. Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-82 percent.
4. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-93 percent (0.15-4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-3 percent (4.90-0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 7 . If throttle valve drive angle sensor tests are okay, go to next step.
5. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185) - IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
6. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets. See **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector

specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 20** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

9. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

P0642/17026: KNOCK SENSOR - ECM MALFUNCTION

NOTE: DTC P0601/16985, DTC P0602/16986, DTC P0604/16988, DTC P0606/16990 and DTC P0642/17026 may set if battery voltage (ECM voltage supply) is to low when vehicle is being started.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below.

- **Beetle**
  Turn ignition off. Move center dash panel forward and up. See **Fig. 5** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

- **Golf & Jetta**
  Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and

disconnect harness connector. Remove ECM. Install ECM.

4. After installing ECM perform following procedures:
   - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
   - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
   - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
   - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
   - On vehicles equipped with A/T, perform adaptation of A/T to its Basic Setting. See **A/T BASIC SETTING** .
   - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
   - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER ADAPTATION TO ECM (J220)** .
   - Perform idle check. See **IDLE CHECK** .
   - Generate ECM readiness code. See **READINESS CODE** .

DTC P0685/17069, P0686/17070, P0687/17071 & P0688/17072: POWER SUPPLY RELAY

Code Definition

DTC P0685/17069
Power Supply Relay (J271) - Open Circuit

DTC P0686/17070
Power Supply Relay (J271) - Short Circuit To Ground

DTC P0687/17071
Power Supply Relay (J271) - Short Circuit To B+

DTC P0688/17072
Power Supply Relay (J271) - Open Load Circuit

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Using DVOM, check resistance of Power Supply Relay wiring. Power Supply Relay is located at left rear of engine compartment. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms for each reading. If resistance is okay, replace faulty Power Supply Relay (J17). If resistance is not okay, repair as necessary. Erase DTC memory. Verify

repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1103/17511: HO2 SENSOR (G39) UPSTREAM TWC, HEATING ELEMENT OUTPUT TOO LOW

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (Black 6-pin). See **Fig. 14** .
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 21** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. **Fig. 22** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 22** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on

DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 12-0 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0170/16554, DTC P0171/16555 & DTC P0172/16556 . If HO2S control signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 22** . Resistance should be a maximum of 1.5 ohms.

8. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1105/17513: HO2 SENSOR (G130) DOWNSTREAM TWC - HEATING CIRCUIT SHORT TO B+

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step (further testing is needed).

3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (Brown 4-pin). See **Fig. 14** .
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 15** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 16** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 16** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 12-0 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S control signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 16** . Resistance should be a maximum of 1.5 ohms.
8. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1113/17521: HO2 SENSOR (G39) UPSTREAM TWC - INTERNAL RESISTANCE TOO HIGH

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all

wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, further testing is needed.
3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (Black 6-pin). See **Fig. 14** .
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 21** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 22** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 22** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 12-0 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7.

NOTE: Before replacing ECM check HO2S control signal. See DTC P0170/16554, DTC P0171/16555 & DTC P0172/16556 . If HO2S control signal is not within specifications it may set a DTC for HO2S heater malfunction.

Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 22** . Resistance should be a maximum of 1.5 ohms.

8. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1117/17525 & P1118/17526: HO2S DOWNSTREAM TWC - HEATING CIRCUIT

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P1117/17525
HO2 Sensor (G130) Downstream TWC - Heating Circuit Short To Ground

DTC P1118/17526
HO2 Sensor (G130) Downstream TWC - Heating Circuit Open

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If

HO2S heater switches, alternating from on to off, go to next step (further testing is needed).

3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (Brown 4-pin). See **Fig. 14** .
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 15** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 16** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 16** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 12-0 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S control signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 16** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1141/17549, P1142/17550 & P1143/17551: LOAD DETECTION

Code Definition

DTC P1141/17549
Load Detection - Implausible Value

DTC P1142/17550
Lower Limit Not Reached

DTC P1143/17551
Load Detection - Upper Limit Exceeded

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, fuel pump relay must be okay, all electrical accessories are off and A/C is off. Ensure no exhaust system leaks exist. Verify engine is mechanically sound and engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Inspect air induction system for leaks. Check air filter for blockage. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle. Using scan tool, check air mass drawn in by engine. Air mass should be 2.0-5.0 grams/second at idle. If air mass reading is okay, go to next step (voltage supply for MAF sensor must be checked). If air mass reading is not okay, go to step 6 .
3. Turn ignition off. Disconnect MAF sensor 5-pin connector. Using DVOM, measure voltage between MAF sensor 5-pin connector, terminal No. 2 and ground. See **Fig. 18** . Start engine and idle. Voltage should be 11-15 volts. If voltage is okay, go to step 5 . If voltage is not okay, go to next step.
4. Turn ignition off. Repair wiring from MAF sensor 5-pin connector, terminal No. 2 and fuel pump relay (J17). See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition on. Using DVOM, check voltage between MAF sensor 5-pin harness connector, terminal No. 4 and ground. See **Fig. 18** . Voltage should be 4.5-5.5 volts. If voltage is okay, go to next step (further circuit tests are required). If voltage is not okay, go to next step.
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following MAF sensor (G70) harness connector terminals and test box sockets. See **Fig. 18** .
   - MAF sensor harness connector terminal No. 3 and test box socket No. 27.
   - MAF sensor harness connector terminal No. 4 and test box socket No. 53.
   - MAF sensor harness connector terminal No. 5 and test box socket No. 29.

   Resistance should be a maximum of 1.5 ohms for each reading. If resistance measurements are okay, go

to next step. If any resistance measurement is not okay, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Using DVOM, check wiring in MAF sensor 5-pin connector for short circuit to one another, short circuit to ground, or short circuit to B+. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If circuits are okay, go to next step.
8. Check Throttle Valve Control Module (TVCM - J338). See **DTC P0121/16505, DTC P0122/16506 & DTC P0123/16507** . If TVCM, wiring, voltage checks, and grounds are okay. Go to next step. If TVCM, wiring, voltage checks, and/or grounds are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check Accelerator Pedal Position Sensors (APPS 1 - G79) and (APPS 2 - G185). See **DTC P1630/18038, DTC P1631/18039, DTC P1633/18041 & DTC P1634/18042** .
10. If TVCM, APPS 1 and APPS 2, voltage checks, wiring and grounds are okay and DTC P1141/17549, DTC P1142/17550 or DTC P1143/17551 return, replace faulty MAF sensor (G70). After repairs, erase DTC memory. Verify Repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1145/17553: MAF SENSOR (G70) - SHORT TO B+

Test Requirements

Ensure all fuses are okay, fuel pump relay must be okay, battery voltage is at least 11.5 volts, all electrical accessories are off and A/C is off. Ensure no exhaust system leaks exist. Verify engine is mechanically sound and engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Inspect air induction system for leaks. Check air filter for blockage. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle. Using scan tool, check air mass drawn in by engine. Air mass should be 2.0-5.0 grams/second at idle. If air mass reading is okay, go to next step (voltage supply for MAF sensor must be checked). If air mass reading is not okay, go to step 6 .
3. Turn ignition off. Disconnect MAF sensor 5-pin connector. Using DVOM, measure voltage between MAF sensor 5-pin connector, terminal No. 2 and ground. See **Fig. 18** . Start engine and idle. Voltage should be 11-15 volts. If voltage is okay, go to step 5 . If voltage is not okay, go to next step.
4. Turn ignition off. Repair wiring from MAF sensor 5-pin connector, terminal No. 2 and fuel pump relay (J17). See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition on. Using DVOM, check voltage between MAF sensor 5-pin connector, terminal No. 4 and

ground. See **Fig. 18** . Voltage should be 4.5-5.5 volts. If voltage is okay, go to next step (further circuit tests are required). If voltage is not okay, go to next step.

6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following MAF sensor (G70) connector terminals and test box sockets. See **Fig. 18** .
   - MAF sensor harness connector terminal No. 3 and test box socket No. 27.
   - MAF sensor harness connector terminal No. 4 and test box socket No. 53.
   - MAF sensor harness connector terminal No. 5 and test box socket No. 29.

   Resistance should be a maximum of 1.5 ohms for each reading. If resistance measurements are okay, go to next step. If any resistance measurement is not okay, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Using DVOM, check wiring in MAF sensor 5-pin connector for short circuit to one another, short circuit to ground, and short circuit to B+. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If circuits are okay, go to next step.
8. If all wiring, voltage checks, and grounds are okay, and DTC P1145/17553 resets, replace faulty MAF sensor (G70). After repairs, erase DTC memory. Verify Repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

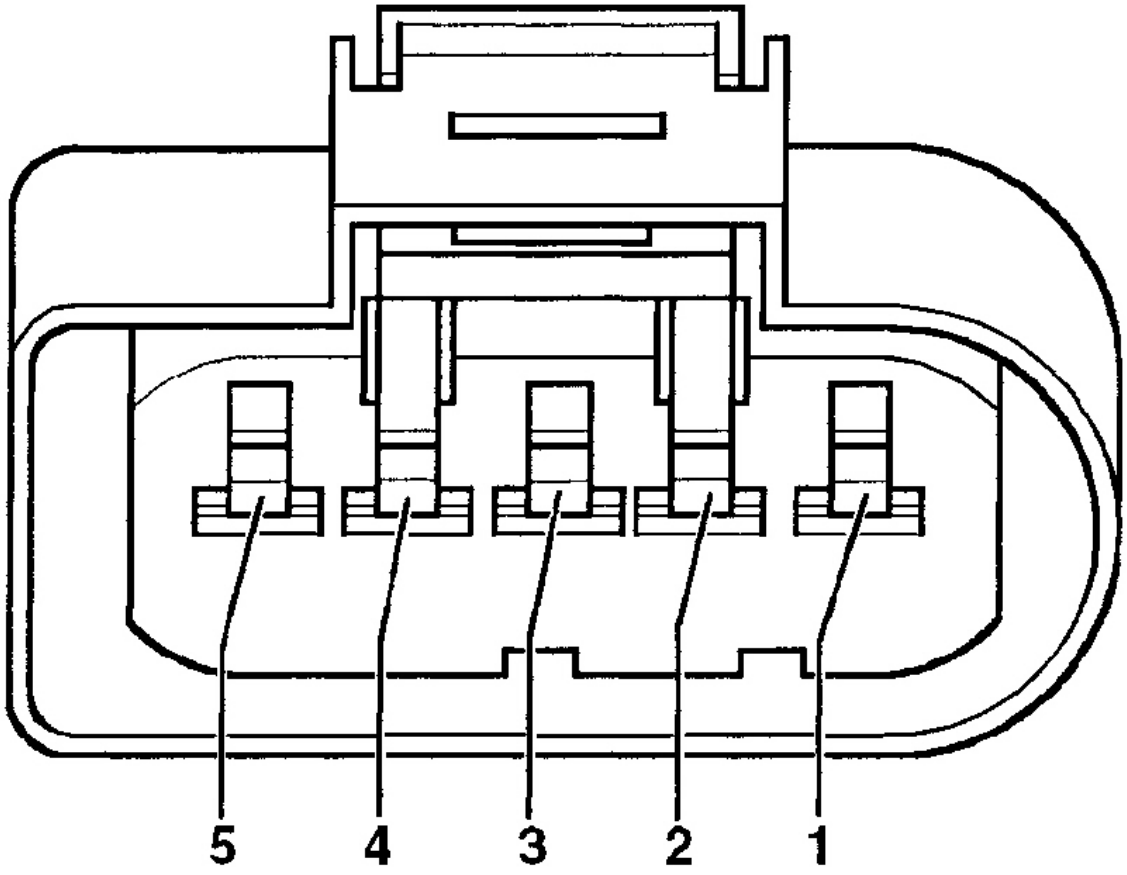


Fig. 45: Identifying Mass Airflow Sensor Harness Connector Terminals (G70)
Courtesy of AUDI OF AMERICA, INC.

DTC P1152/17560: HO2 SENSOR (G130) DOWNSTREAM TWC - LEAN CONTROL LIMIT NOT REACHED

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set.

Test Procedure

1. Check air induction and secondary air injection system for leaks. Check air filter for blockage. If no air leaks are found and air intake is unrestricted, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2.

NOTE: Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If activation and readiness checks are okay and HO2S heater is on. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .

3.

NOTE: Operating range of upstream HO2S is negative 25 to positive 25 (-25-+25) percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 (-10-+10) percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to positive 10 (-10-+10) percent specification is allowed to vary slightly.

Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay, go to step 7 .

4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 (-10-+10) percent (0.3-0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** .
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, go to next step. If fuel injector volume is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. See **DTC P0440/16824 & DTC P0441/16825** . If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

10.

NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.

Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

11. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover. Disconnect upstream HO2S (G39) harness connector (Black 6-pin). See **Fig. 14** .
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 22** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.

    Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
13. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1166/17574: HO2 SENSOR (G130) DOWNSTREAM TWC - RICH CONTROL LIMIT EXCEEDED

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction, secondary air injection and exhaust system for leaks. Check air filter for blockage. If no air or exhaust leaks are found and air intake is unrestricted, go to next step. If air or exhaust leaks are found and/or air intake is restricted. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: For rich control exceeded Downstream TWC, Upstream TWC HO2S needs**

to be checked first. Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If activation and readiness checks are okay and HO2S heater is on. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .

3. **NOTE: Operating range of upstream HO2S is negative 25 to positive 25 (-25-+25) percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 (-10-+10) percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to positive 10 (-10-+10) percent specification is allowed to vary slightly.**

   Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 (-10-+10) percent (0.3-0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay, go to step 7 .

4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 (-10-+10) percent (0.3-0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If downstream HO2S control is okay. Go to next step.
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. See **DTC P0440/16824 & DTC P0441/16825** . If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve

is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

10. **NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.**

    Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

11. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover. Disconnect upstream HO2S (G39) harness connector (Black 6-pin). See **Fig. 14** .
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 22** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.

    Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
13. If any resistance measurement is not okay, or a short circuit exist, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1176: HO2 SENSOR (G39) CORRECTION UPSTREAM TWC, HO2 SENSOR (G130) DOWNSTREAM TWC - CONTROL LIMIT REACHED (AGING)

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

NOTE: Manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052 to diagnose this circuit.

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to next step. If using generic scan tool, follow scan tool manufacturer's instructions, check aging of upstream HO2S. If scan tool indicates aging of upstream HO2S is not okay, go to step 6 . If scan tool indicates aging of upstream HO2S is okay. Go to step 4 .
3. **NOTE: Catalytic converter must be 662-932° F (350-500° C) for scan tool to switch from "Test off" to "Test on".**

   Using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "system in basic setting 43". Using accelerator pedal prop manually set engine speed to 2300-2500 RPM. Maintain engine speed of 2300-2500 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 2300-2500 RPM until scan tool displays specification "B1-S2 OK". If scan tool does not display "B1-S2 OK", go to step 6 . If scan tool displays "B1-S2 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If downstream HO2S control is okay. Go to next step.
5. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1178/17586, P1179/17587 & P1180/17588: HO2S UPSTREAM TWC - PUMP CURRENT

Code Definition

DTC P1178/17586
HO2 Sensor (G39) Upstream TWC - Pump Current, Open Circuit

DTC P1179/17587
HO2 Sensor (G39) Upstream TWC - Pump Current, Short To Ground

DTC P1180/17588
HO2 Sensor (G39) Upstream TWC - Pump Current, Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no air induction and secondary air injection system for leaks exist. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 22** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.
2. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S.
3. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exist, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1181/17589, P1182/17590 & P1183/17591: HO2S UPSTREAM TWC - REFERENCE VOLTAGE

Code Definition

DTC P1181/17589
HO2 Sensor (G39) Upstream TWC, Reference Voltage - Open Circuit

DTC P1182/17590
HO2 Sensor (G39) Upstream TWC, Reference Voltage - Short To Ground

DTC P1183/17591
HO2 Sensor (G39) Upstream TWC, Reference Voltage - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no air induction and secondary air injection system for leaks exist. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 22** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.
2. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S.
3. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exist, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1184/17592, P1185/17593 & P1186/17594: HO2S UPSTREAM TWC - COMMON GROUND WIRE

Code Definition

DTC P1184/17592
HO2 Sensor (G39) Upstream TWC, Common Ground Wire - Open Circuit

DTC P1185/17593
HO2 Sensor (G39) Upstream TWC, Common Ground Wire - Short To Ground

DTC P1186/17594
HO2 Sensor (G39) Upstream TWC, Common Ground Wire - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no air induction and secondary air injection system for leaks exist. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 22** .

- Upstream HO2S connector terminal No. 1 and test box socket No. 70.

- Upstream HO2S connector terminal No. 2 and test box socket No. 71.
- Upstream HO2S connector terminal No. 5 and test box socket No. 51.
- Upstream HO2S connector terminal No. 6 and test box socket No. 52.

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exist, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1296/17704: MALFUNCTION IN COOLING SYSTEM

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: To bleed cooling system, fill cooling system. Warm engine to operating temperature, (run engine until coolant fan starts), do not allow engine to overheat, let engine cool and recheck coolant level.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant system and engine coolant system thermostat are in good working order. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Engine must be cold before performing test procedure.

1. Disconnect ECT sensor harness connector. See **Fig. 46** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals C (Signal) and D (Ground). See **Fig. 47** . See **ECT SENSOR (G62) RESISTANCE** table.
2. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check cooling system thermostat and cooling system. Repair as necessary. After repairs, erase DTC

memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

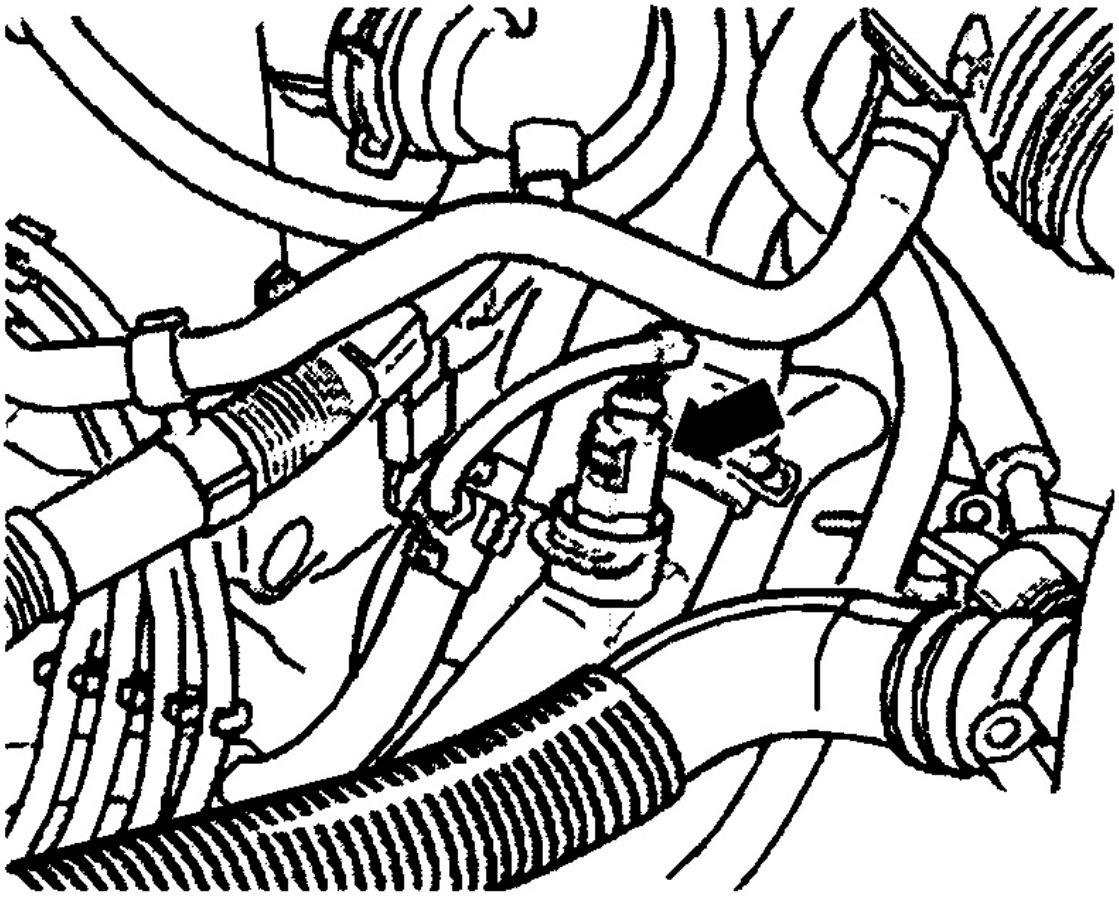
4. Engine should be cold. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 6 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
5. **NOTE: Scan Tool (VAG 1551) and (VAG 1552) displays temperature in 1-1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.**

   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 8 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
7. Disconnect ECT sensor harness connector. See **Fig. 46** . Using a jumper wire, bridge terminal No. 3 and terminal No. 4 of ECT sensor harness connector. See **Fig. 48** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 9 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Disconnect ECT sensor harness connector. See **Fig. 46** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor harness connector. See **Fig. 46** . Using DVOM, measure resistance between ECT sensor harness connector terminal No. 3 and test box socket No. 93. See **Fig. 48** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 4 and test box socket No. 108. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
10. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 108. See **Fig. 48** . Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive and ground. Check ECT sensor harness connector terminal No. 4 for short circuit to B+. Repair as necessary.
11. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN**

PROCEDURE .

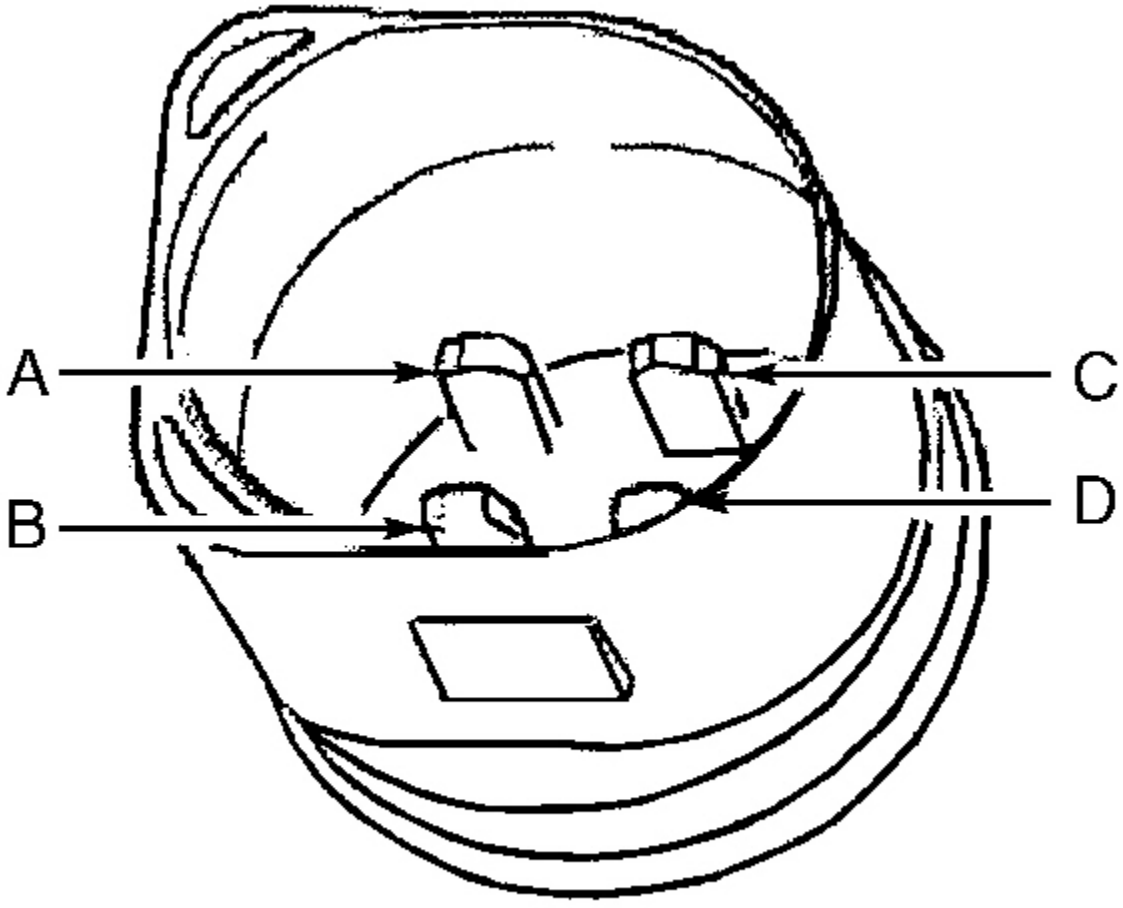
ECT SENSOR (G62) RESISTANCE

Temperature °F (°C)	Ohms
86 (30)	1500-2000
104 (40)	1000-1500
122 (50)	800-1000
140 (60)	500-700
158 (70)	375-500
176 (80)	275-375
194 (90)	225-275



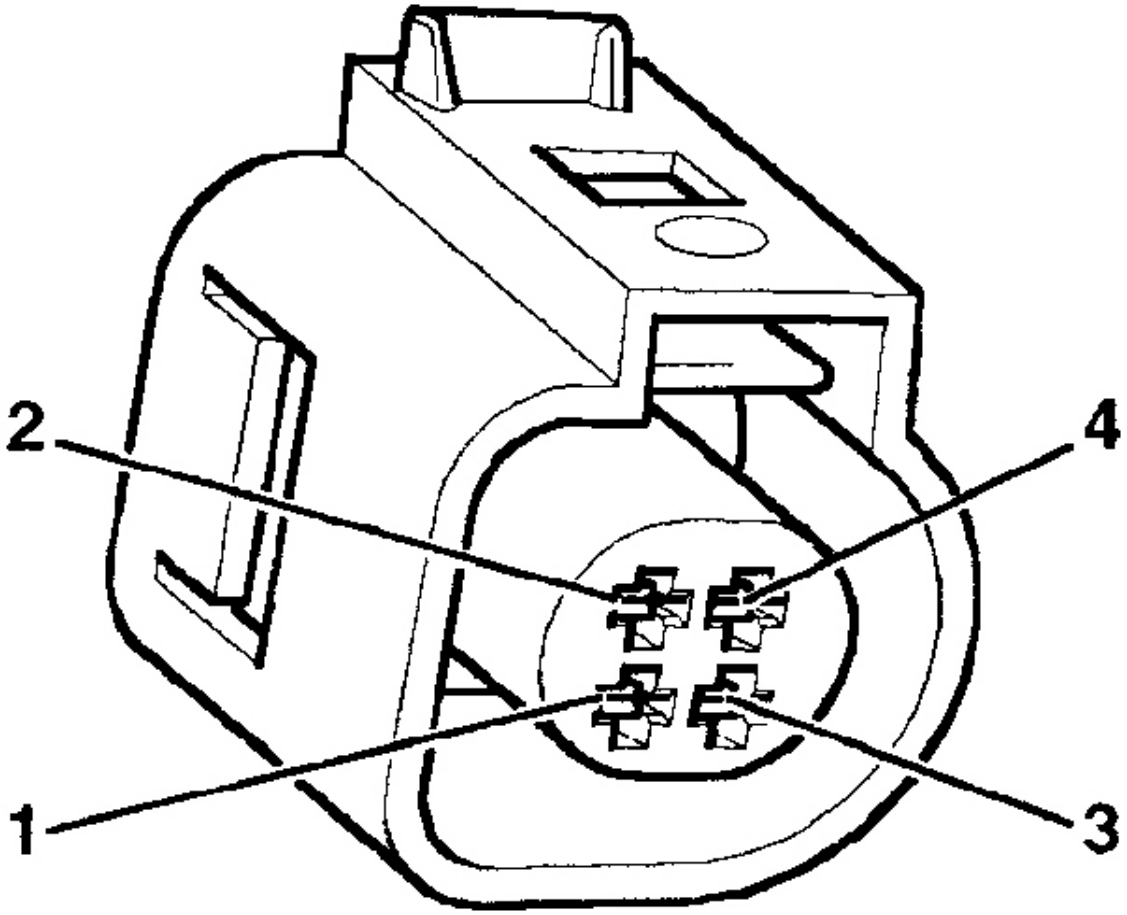
G00083412

Fig. 46: Locating ECT Sensor (G62 - Beetle, Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00073505

Fig. 47: Testing ECT Sensor (G62 - Beetle, Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00077164

Fig. 48: Identifying Test Points On ECT Sensor Harness Connector (Beetle, Golf & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1325/17733, P1326/17734, P1327/17735 & P1328/17736: KNOCK CONTROL - LIMIT REACHED

Code Definition

DTC P1325/17733
Knock Control, Cylinder 1 - Limit Reached

DTC P1326/17734
Knock Control, Cylinder 2 - Limit Reached

DTC P1327/17735
Knock Control, Cylinder 3 - Limit Reached

DTC P1328/17736
Knock Control, Cylinder 4 - Limit Reached

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: To ensure knock sensors perform perfectly, it is extremely important that knock sensors are tightened to 15 ft. lbs. (20 N.m). Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.

1. Fill fuel tank with 91 RON gasoline. Check knock sensor harness connectors for corrosion, damage and proper installation. Loosen knock sensors and tighten to 15 ft. lbs. (20 N.m). Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
2. Check engine for mechanical noise, repair as necessary. If no mechanical noise is found, go to next step. If repairs were made and mechanical noise eliminated, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
3. Turn ignition off. Disconnect knock sensor No. 1 and 2 harness connectors. Check resistance between contacts at each knock sensor, resistance should be infinite (no continuity). If no continuity is present in resistance reading, go to next step. If continuity is present in resistance reading, replace faulty knock sensor(s). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following knock sensor harness connectors and VAG test box sockets. Check wiring for short circuit to one another in Knock sensor No. 1 (G61) harness connector. Check wiring for short circuit to one another in Knock sensor No. 2 (G66) harness connector. See **KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 33** . Resistance should be a maximum of 1.5 ohms. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) reset, replace faulty knock sensor(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1335/17743 & P1336/17744: ENGINE TORQUE MONITORING

Code Definition

DTC P1335/17743
Engine Torque Monitoring 2 - Control Limit Exceeded

DTC P1336/17744
Engine Torque Monitoring - Control Limit Exceeded

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Turn engine off. Check air induction system pipes and hoses for damage and lose fit, repair as necessary. If pipes and hoses are okay, go to next step. If repair(s) where made to air induction system, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check IAT sensor. See **DTC P0112/16496 & DTC P0113/16497** . If IAT sensor is okay, go to next step. If IAT sensor is not okay, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check MAF sensor. See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Check ECT sensor. See **DTC P1296/17704: MALFUNCTION IN COOLING SYSTEM** . If ECT sensor is not okay, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1337/17745, P1338/17746 & P1340/17748: CAMSHAFT POSITION SENSOR

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P1337/17745
Camshaft Position Sensor (G163) - Open Circuit/Short To Ground

DTC P1338/17746
Camshaft Position Sensor (G163) - Open Circuit/Short To B+

DTC P1340/17748
Camshaft Position Sensor (G163) - Engine Speed (RPM) Sensor (G28), Incorrect Allocation

Test Requirement

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical

accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). Ensure Camshaft Position (CMP) sensor is bolted on tightly. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

NOTE: Manufacturer's alpha-numeric identification for CMP sensor is (G40).

Test Procedure

NOTE: For DTC P1340/17748, go to step 4 .

1. Disconnect CMP sensor 3-pin harness connector. See **Fig. 34** . Turn ignition on. Using DVOM measure voltage between terminals No. 1 and 3 of CMP sensor 3-pin harness connector. See **Fig. 32** . Voltage should be 4.0-6.0 volts. Turn ignition off. If readings are okay, go to next step (further testing is needed). If readings are not okay, go to next step.
2. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following CMP sensor harness connector terminals and test box sockets. See **Fig. 32** .
   - CMP sensor harness connector terminal No. 1 and test box socket No. 98.
   - CMP sensor harness connector terminal No. 2 and test box socket No. 86.
   - CMP sensor harness connector terminal No. 3 and test box socket No. 108.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in CMP sensor 3-pin harness connector for short circuits to one another.
3. If CMP sensor harness connector circuits are okay and 4.0-6.0 volts are present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace faulty CMP sensor. If CMP sensor harness connector circuits are okay, but no voltage is present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. **NOTE: If DTC P0321/16705 and/or DTC P0322/16706 (Engine Speed (RPM) sensor codes) are also present. See DTC P0321/16705 & DTC P0322/16706 .**

   For DTC P1340/17748, if CMP sensor is okay check camshaft timing. See appropriate TIMING BELT article in ENGINE.

DTC P1355/17763, P1356/17764, P1357/17765, P1358/17766, P1359/17767 & P1360/17768: IGNITION ACTIVATION - CYLINDERS NO. 1/NO. 2

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P1355/17763
Ignition Activation Cylinder 1 - Open Circuit

DTC P1356/17764
Ignition Activation Cylinder 1 - Short To B+

DTC P1357/17765
Ignition Activation Cylinder 1 - Short To Ground

DTC P1358/17766
Ignition Activation Cylinder 2 - Open Circuit

DTC P1359/17767
Ignition Activation Cylinder 2 - Short To B+

DTC P1360/17768
Ignition Activation Cylinder 2 - Short To Ground

Test Requirements

Ensure Camshaft Position (CMP) sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748** . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705 & DTC P0322/16706** .

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Turn ignition off. Remove and check condition of ignition wire and spark plug at misfiring cylinder. Ignition wire w/spark plug connector should have 4000-8000 ohms of resistance. If ignition wire is not okay, replace ignition wire set. Check spark plug for correct heat range. If spark plug(s) are okay, go to next step. If spark plug(s) are not okay, replace spark plugs as a set. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Using DVOM, check supply voltage between terminals No. 1 and 6. See **Fig. 29** . Voltage should a minimum of 11.5 volts, (battery voltage). If voltage is okay, go to step 4 . If voltage is not okay, go to next step.
3. Using DVOM, check wiring for open circuit between ignition coil harness connector terminal No. 6 and power supply relay using wiring diagram. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and **Fig. 29** . Check wiring for open circuit between ignition coil harness connector terminal No. 1 and ground. See **Fig. 29** . Resistance reading should be a maximum of

1.5 ohms for each reading. If resistance readings are okay, go to next step. If any resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. **WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.**

   Remove fuse No. 32 (disables fuel injectors). Using LED test light, check voltage supply to ignition coil of cylinder indicated to be misfiring. See **IGNITION COIL HARNESS CONNECTOR VOLTAGE TEST POINTS IDENTIFICATION** table. Disconnect ignition coil harness connector. See **Fig. 28** . Have a second person crank engine. LED should flash. Turn ignition off. If LED did not flash (no voltage is present), go to next step. If LED flashed (voltage readings are okay) and voltage is present between terminals No. 1 and 6, replace faulty ignition coil w/output stage. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 29** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1361/17769, P1362/17770, P1363/17771, P1364/17772, P1365/17773 & P1366/17774: IGNITION ACTIVATION - CYLINDERS NO. 3/NO. 4

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P1361/17769
Ignition Activation Cylinder 3 - Open Circuit

DTC P1362/17770
Ignition Activation Cylinder 3 - Short To B+

DTC P1363/17771
Ignition Activation Cylinder 3 - Short To Ground

DTC P1364/17772
Ignition Activation Cylinder 4 - Open Circuit

DTC P1365/17773
Ignition Activation Cylinder 4 - Short To B+

DTC P1366/17774
Ignition Activation Cylinder 4 - Short To Ground

Test Requirements

Ensure Camshaft Position sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748** . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705 & DTC P0322/16706** .

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Turn ignition off. Remove and check condition of ignition wire and spark plug at misfiring cylinder. Ignition wire w/spark plug connector should have 4000-8000 ohms of resistance. If ignition wire is not okay, replace ignition wire set. Check spark plug for correct heat range. If spark plug(s) are okay, go to next step. If spark plug(s) are not okay, replace spark plugs as a set. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Using DVOM, check supply voltage between terminals No. 1 and 6. See **Fig. 29** . Voltage should a minimum of 11.5 volts, (battery voltage). If voltage is okay, go to step 4 . If voltage is not okay, go to next step.
3. Using DVOM, check wiring for open circuit between ignition coil harness connector terminal No. 6 and power supply relay using wiring diagram. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 29** . Check wiring for open circuit between ignition coil harness connector terminal No. 1 and ground. See **Fig. 29** . Resistance reading should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If any resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4.

WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.

Remove fuse No. 32 (disables fuel injectors). Using LED test light, check voltage supply to ignition coil of cylinder indicated to be misfiring. See **IGNITION COIL HARNESS CONNECTOR VOLTAGE TEST POINTS IDENTIFICATION** table. Disconnect ignition coil harness connector. See **Fig. 28** . Have a second person crank engine. LED should flash. Turn ignition off. If LED did not flash (no voltage is present), go to next step. If LED flashed (voltage readings are okay) and voltage is present between terminals No. 1 and 6, replace faulty ignition coil w/output stage. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 29** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1386/17794, P1387/17795 & P1388/17796: ECM MALFUNCTION

Code Definition

DTC P1386/17794
ECM (J220) - Malfunction

DTC P1387/17795
ECM (J220) - Malfunction

DTC P1388/17796
ECM (J220) - Malfunction

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE

CONTROL MODULE (J220) - ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

2. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below:

   - **Beetle**
     Turn ignition off. Move center dash panel forward and up. See **Fig. 5** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

   - **Golf & Jetta**
     Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

4. After installing ECM perform following procedures:
   - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
   - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
   - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
   - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
   - On vehicles equipped with A/T, perform adaptation of A/T to its Basic Setting. See **A/T BASIC SETTING** .
   - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
   - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER ADAPTATION TO ECM (J220)** .
   - Perform idle check. See **IDLE CHECK** .
   - Generate ECM readiness code. See **READINESS CODE** .

DTC P1471/17879, P1472/17880 & P1473/17881: EVAP LEAK DETECTION PUMP - OPEN OR SHORT

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P1471/17879
EVAP Leak Detection Pump (V144) - Short To B+

DTC P1472/17880
EVAP Leak Detection Pump (V144) - Short To Ground

DTC P1473/17881
EVAP Leak Detection Pump (V144) - Open Circuit

Test Requirements

Ensure intake air is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C). Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions to check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive, test is complete. If DTC returns on test drive, go to next step.
3. Check EVAP Canister Purge Valve (N80). See **DTC P0441/16825** .
4. Check EVAP Leak Detection Pump (V144) using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals (cycle on and off). If EVAP Leak Detection Pump (V144) does not run, go to next step.
5. Disconnect EVAP Leak Detection Pump (V144) harness connector. Install LED test light at EVAP leak

detection pump harness connector terminal No. 2 and B+. See **Fig. 37** .

6. Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** .
7. Turn ignition off. Install LED test light at EVAP leak detection pump harness connector terminal No. 3 and Ground.
8. Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash during each test. If LED test light does not flash during each test, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes during each test, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 37** .
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17).

   Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1 and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.
10. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1475/17883 & P1476/17884: EVAP LEAK DETECTION PUMP - NO SIGNAL

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P1475/17883
EVAP Leak Detection Pump (V144) - No Signal

DTC P1476/17884
EVAP Leak Detection Pump (V144) - Insufficient Vacuum

Test Requirements

Ensure intake air is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C).

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. Follow scan tool manufacturer's instructions.

1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions, check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If DTC returns on test drive, go to next step.
3. Check EVAP Canister Purge Valve (N80). See **DTC P0441/16825** .
4. Check EVAP Leak Detection Pump (V144) using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals (cycle on and off). If EVAP Leak Detection Pump (V144) does not run, go to next step.
5. Disconnect EVAP Leak Detection Pump (V144) harness connector, install LED test light at EVAP leak detection pump harness connector terminal No. 2 and B+. See **Fig. 37** .
6. Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** .
7. Turn ignition off. Install LED test light at EVAP leak detection pump harness connector terminal No. 3 and Ground.
8. Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash during each test. If LED test light does not flash during each test, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes during each test, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect

Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 37** .

- EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
- EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.
- EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17).

Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1 and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.

10. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1501/17909 & P1502/17910: FUEL PUMP RELAY

Code Definition

DTC P1501/17909
Fuel Pump Relay (J17) - Short To Ground

DTC P1502/17910
Fuel Pump Relay (J17) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Using DVOM, check power supply and ground to Fuel Pump Relay. See **Fig. 27** . See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.
2. Check resistance of Fuel Pump Relay wiring. Resistance should be a maximum of 1.5 ohms for each reading.
3. Check Fuel Pump Relay wiring for short circuits to one another, and for short circuits to B+ and ground.
4. If resistance, voltage and ground supply are okay and no short circuits are present, replace faulty Fuel Pump Relay (J17). If resistance and/or voltage or ground supply are not okay or a short circuit is present, repair as necessary. Erase DTC memory. Test is complete.
5. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1539/17947: CLUTCH VACUUM VENT SWITCH (F36) - IMPLAUSIBLE SIGNAL

NOTE: **If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
2. Turn ignition on, with engine off. Following scan tool manufacturer's instructions, check Clutch Vacuum Vent Switch (F36) for DTCs. This is done in display group 66 when using Scan Tool VAG 1551/1552 or VAS 5051/5052. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check Clutch Vacuum Vent Switch (F36). Remove trim at clutch pedal to access clutch vacuum vent switch and disconnect clutch vacuum vent switch harness connector. Using DVOM check resistance at clutch vacuum vent switch. Resistance should be zero ohms (closed circuit). Depress clutch pedal. Resistance should be infinite (open circuit). If Clutch Vacuum Vent Switch (F36) is okay , go to next step. If Clutch Vacuum Vent Switch (F36) is not okay, replace faulty Clutch Vacuum Vent Switch (F36). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Using DVOM check Clutch Vacuum Vent Switch (F36) harness connector wiring resistance. Resistance should be a maximum of 1.5 ohms for each reading. Check Clutch Vacuum Vent Switch (F36) harness connector wiring for short circuit to one another, short circuit to ground, and short circuit to B+. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. If Clutch Vacuum Vent Switch (F36) is okay and wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1541/17949: FUEL PUMP RELAY (J17) - OPEN CIRCUIT

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Using DVOM, check power supply and ground to Fuel Pump Relay. See **Fig. 27** . See ENGINE

PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.

2. Check resistance of Fuel Pump Relay wiring. Resistance should be a maximum of 1.5 ohms for each reading.
3. Check Fuel Pump Relay wiring for short circuits to one another, and for short circuits to B+ and ground.
4. If resistance, voltage and ground supply are okay and no short circuits are present, replace faulty Fuel Pump Relay (J17). If resistance and/or voltage or ground supply are not okay or a short circuit is present, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1542/17950 & P1545/17953: TVCM ANGLE SENSOR1

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

DTC P1542/17950
Angle Sensor 1 (G187) For Throttle Valve Drive - Implausible Signal

DTC P1545/17953
Throttle Valve Control Malfunction

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors.

Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 19** . Specification is one to 5 ohms.
2. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188) at idle stop. Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-16 percent. Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-82 percent.
4. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
5. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-93 percent (0.15-4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-3 percent (4.90-0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 8 . If throttle valve drive angle sensor tests are okay, go to next step.
6. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185) - IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
7. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using

DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets. See **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

9. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 20** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
11. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1558/17966: THROTTLE VALVE DRIVE (186) - CIRCUIT MALFUNCTION

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors.

Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 19** . Specification is 1-5 ohms.
2. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188) at idle stop. Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-16 percent. Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-82 percent.
4. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-93 percent (0.15-4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-3 percent (4.90-0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 7 . If throttle valve drive angle sensor tests are okay, go to next step.
5. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
6. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using

DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets. See **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

8. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 20** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1559/17967: THROTTLE VALVE CONTROL MODULE (J338) - MALFUNCTION IN BASIC SETTING

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Throttle Valve Control Module Adaption

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 060, (VAG 1551/1552 or VAS 5051/5052). Follow scan tool manufacturer's instructions.

NOTE: Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 50-194° F (10-90° C). Battery voltage a minimum of 11.5 volts.

1. Connect scan tool to DLC. DLC is located on left side of steering column. Using scan tool check and clear any DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
2.

   NOTE: ECM will abort adaptation if; throttle valve cannot be closed completely (e.g. dirty throttle body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation.

   Using scan tool, follow scan tool manufacturer's instructions for TVCM (J338) adaptation. If you are using Scan Tool VAG 1551/1552 or VAS 5051/5052, from selection 1 enter diagnostic function 04 - BASIC SETTING. Follow scan tool instructions to enter diagnostic function 04 - BASIC SETTING function. Enter DISPLAY GROUP 060. Follow scan tool instructions for TVCM (J338) adaptation.

DTC P1564/17972: THROTTLE VALVE CONTROL MODULE (J338) - VOLTAGE TOO LOW DURING BASIC SETTING

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Throttle Valve Control Module Adaption

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 060, (VAG 1551/1552 or VAS 5051/5052). Follow scan tool manufacturer's instructions.

1.

   NOTE: Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 50-194° F (10-90° C). Battery voltage a minimum of 11.5 volts.

   Check charging system and battery condition. Repair as necessary. Go to next step.

2. Connect scan tool to DLC. DLC is located on left side of steering column. Using scan tool check and clear any DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3.

NOTE: ECM will abort adaptation if; throttle valve cannot be closed completely (e.g.: dirty throttle body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation.

Using scan tool, follow scan tool manufacturer's instructions for TVCM (J338) adaptation. If you are using Scan Tool VAG 1551/1552 or VAS 5051/5052, from selection 1 enter diagnostic function 04 - BASIC SETTING. Follow scan tool instructions to enter diagnostic function 04 - BASIC SETTING function. Enter DISPLAY GROUP 060. Follow scan tool instructions for TVCM (J338) adaptation.

DTC P1568/17976: THROTTLE VALVE CONTROL MODULE (J338) - MECHANICAL MALFUNCTION

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors.

Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan

tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. Check throttle body for residue/dirt buildup. Clean throttle body as necessary. Check throttle body for damage. Repair or replace throttle body as necessary. If throttle body was cleaned, repaired or replaced, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC resets on test drive, go to next step.
2. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 19Fig. 20** . Specification is 1-5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188) at idle stop. Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-16 percent. Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-82 percent.
4. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3-93 percent (0.15-4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97-3 percent (4.90-0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 7 . If throttle valve drive angle sensor tests are okay, go to next step.
5. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
6. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets. See **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings.
8. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance

measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

9. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 20** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
11. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1570/17978: ECM (J220) - BLOCKED

Immobilizer Adaptation To ECM (J220)

NOTE: Manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052. Starting with Model Year 2002, Golf and Jetta are equipped with Immobilizer Generation III (Starting 6/2001 for Beetle). Ignition keys for Immobilizer III may be marked "W3". Scan Tool VAS 5051 or VAS 5052 must be used for Immobilizer Generation III diagnoses and coding. A correct Importer/Dealer number must reside in VAS 5051 or VAS 5052 in order to request a PIN number and to adapt Immobilizer Generation III.

Authorized vehicle key required. Connect scan tool. Switch ignition on. Follow scan tool manufacturer's instructions for immobilizer adaptation to ECM.

NOTE: Identity of ECM is read into the immobilizer control module next time ignition is switched on.

DTC P1579/17987: THROTTLE VALVE CONTROL MODULE (J338) - ADAPTION NOT STARTED

NOTE: This DTC may set if TVCM (J338) has been replaced, and not adapted to ECM.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Throttle Valve Control Module Adaption

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 060, (VAG 1551/1552 or VAS 5051/5052). Follow scan tool manufacturer's instructions.

1.

NOTE: Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 50-194° F (10-90° C). Battery voltage a minimum of 11.5 volts.

Connect scan tool to DLC. DLC is located on left side of steering column. Using scan tool check and clear any DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .

2.

NOTE: ECM will abort adaptation if: throttle valve cannot be closed completely (e.g.: dirty throttle body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation.

Using scan tool, follow scan tool manufacturer's instructions for TVCM (J338) adaptation. If you are using Scan Tool VAG 1551/1552 or VAS 5051/5052, from selection 1 enter diagnostic function 04 - BASIC SETTING. Follow scan tool instructions to enter diagnostic function 04 - BASIC SETTING function. Enter DISPLAY GROUP 060. Follow scan tool instructions for TVCM (J338) adaptation.

DTC P01602/18010: VOLTAGE SUPPLY TERMINAL 30 (B+) - VOLTAGE SUPPLY TOO LOW

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052). The following tests are preformed using Scan Tool (VAG 1551/1552 or VAS 5051/5052).

1. Ensure battery is okay. Ensure battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure battery and engine to body grounds are okay. Repair as necessary. Turn off all electrical consumers and A/C. Shift lever in park (A/T) or neutral (M/T) and set parking brake. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle.
2. Using scan tool. Read supply voltage for ECM. Voltage should be 12-14.5 volts. End scan tool data output. Turn ignition off. If voltage is less than 12V, go to next step. If voltage is more than 14.5 volts, go to step 4 . If voltage checks are okay, ECM power and ground circuits are okay. Test is complete.
3. Check battery, alternator, parasitic load and ECM grounds. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. Repair as necessary. If repairs where performed, repeat steps 1 and 2 . If battery, alternator, parasitic load and ECM grounds are okay, go to step 5 .
4. Possible cause is alternator and/or voltage regulator failure. Repair as necessary. If repairs were performed, repeat steps 1 and 2 . If alternator and voltage regulator are okay, go to next step.
5. Turn ignition off. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Go to next step.
6. **NOTE: If test box is not available. Use wiring diagram and DVOM to check ECM grounds and voltage supply. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL.**

   Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and DVOM. Measure voltage supply at test box sockets No. 1 and 62 (ground and B+ 30). Battery voltage should be present. If voltage test has failed, go to next step. If both voltage checks are okay. ECM power and ground circuits are okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Check voltage supply to ECM power supply relay. Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and a DVOM, measure voltage supply at test box sockets No. 2 and 121. Battery voltage should be present. If voltage test has failed, go to next step. If voltage check is okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check wiring connections on relay panel. Repair as necessary. Verify repairs. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P01603/18011: ECM (J220) - MALFUNCTION

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below:

    - **Beetle**
      Turn ignition off. Move center dash panel forward and up. See **Fig. 5** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **Golf & Jetta**
      Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

4. After installing ECM perform following procedures:
    - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
    - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
    - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
    - On vehicles equipped with A/T, perform adaptation of A/T to its Basic Setting. See **A/T BASIC SETTING** .
    - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
    - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER ADAPTATION TO ECM (J220)** .
    - Perform idle check. See **IDLE CHECK** .
    - Generate ECM readiness code. See **READINESS CODE** .

DTC P1609/18017: CRASH SIGNAL FROM AIR BAG CONTROL MODULE (J234)

WARNING: Accidental air bag deployment is possible. Personal injury may result. Read and follow all WARNINGS in AIR BAG SAFETY PRECAUTIONS before working on air bag system or related components. See AIR BAG SAFETY PRECAUTIONS in appropriate AIR BAG RESTRAINTS SYSTEM article, under RESTRAINTS.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Check Air Bag Control Module (J234) for DTC(s). See appropriate AIR BAG RESTRAINTS SYSTEM article, under RESTRAINTS. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1612/18020: ECM (J220) - INCORRECTLY CODED

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

ECM Coding

Use scan tool to code ECM. See **ENGINE CONTROL MODULE (J220) CODING** .

DTC P1626/18034: DRIVETRAIN DATA BUS, NO SIGNAL FROM TRANSMISSION CONTROL MODULE (J217)

Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Transmission Control Module (J217) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Transmission Control Module (J217) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 42** , **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** .
4. Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1630/18038, P1631/18039, P1633/18041 & P1634/18042: ACCELERATOR PEDAL POSITION SENSOR SIGNAL

Code Definition

DTC P1630/18038
Accelerator Pedal Position Sensor 1 (G79) - Signal Too Low

DTC P1631/18039
Accelerator Pedal Position Sensor 1 (G79) - Signal Too High

DTC P1633/18041
Accelerator Pedal Position Sensor 2 (G185) - Signal Too Low

DTC P1634/18042
Accelerator Pedal Position Sensor 2 (G185) - Signal Too High

Circuit/Component Description

Accelerator Pedal Position (APP) sensor No. 1 (G79) and APP sensor No. 2 (G185) are located together as one unit in pedal assembly. APP sensors sense the position of the accelerator pedal, not throttle position.

When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) communicate driver's intentions to ECM, fully independent of each other. Specification for APP sensor No. 1 (G79) is 12-97 percent (0.60-4.9 volts). APP Sensor No. 2 (G185) ranges from 4-50 percent (0.20-2.50 volts), the larger the throttle opening the higher the percentage (voltage) reading.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Test ranges for accelerator position sensors may not fully display on scan tool. Percentage (voltage) should always be twice as large for APP sensor No. 1 (G79) as the percentage (voltage) for APP sensor No. 2 (G185). No idle specifications for APP sensors are given by manufacturer.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading on APP sensors No. 1 (G79) and No. 2 (G185).
2. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for APP sensor No. 1 (G79) and APP sensor No. 2 (G185). Specification for APP sensor No. 1 (G79) is 12-97 percent (0.60-4.9 volts). Specification for APP sensor No. 2 (G185) is 4-50 percent (0.20-2.50 volts). If percentage (voltage) is not okay, go to next step. If percentage (voltage) is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Remove drive's side footwell cover and trim as necessary. Disconnect APP sensors 6-pin harness connector. Turn ignition on. Check voltage supply at 6-pin harness connector. See **Fig. 26** . See **APP SENSOR VOLTAGE SPECIFICATIONS** table. Turn ignition off. If no voltage is present, go to next step. If voltage tests are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. **NOTE: If accelerator pedal assembly is replaced, APP sensors must be adapted to the A/T control module.**

   Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) or (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between APP sensor circuits and test box sockets. See **APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in APP sensor 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE**

RELEARN PROCEDURE .

5. Replace faulty APP sensors No. 1 (G79) and No. 2 (G185). Accelerator position sensors are an integral part of the accelerator pedal assembly. After repairs, erase DTC memory. Adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1636/18044: DRIVETRAIN DATA BUS - NO SIGNAL FROM AIRBAG CONTROL MODULE (J234)

Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Test Procedure

1. Check Air Bag Control Module (J234) for DTC(s). See appropriate AIR BAG RESTRAINT SYSTEMS article under RESTRAINTS. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Air Bag Control Module (J234) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 42** , **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance

should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1639/18047: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185) - IMPLAUSIBLE SIGNAL

Circuit/Component Description

Accelerator Pedal Position (APP) sensor No. 1 (G79) and APP sensor No. 2 (G185) are located together as one unit in pedal assembly. APP sensors sense the position of the accelerator pedal, not throttle position.

When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) communicate driver's intentions to ECM, fully independent of each other. Specification for APP sensor No. 1 (G79) is 12-96 percent (0.60-4.9 volts). APP Sensor No. 2 (G185) ranges from 4-50 percent (0.20-2.50 volts), the larger the throttle opening the higher the percentage (voltage) reading.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

NOTE: Test ranges for accelerator position sensors may not fully display on scan tool. Percentage (voltage) should always be twice as large for APP sensor No. 1 (G79) as the percentage (voltage) for APP sensor No. 2 (G185). No idle specifications for APP sensors are given by manufacturer.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading on APP sensors No. 1 (G79) and No. 2 (G185).
2. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for APP sensor No. 1 (G79) and APP sensor No. 2 (G185). Specification for APP sensor No. 1 (G79) is 12-97 percent (0.60-4.9 volts). Specification for APP sensor No. 2 (G185) is 4-50 percent (0.20-2.50 volts). If percentage (voltage) is not okay, go to next step. If percentage (voltage) is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Remove drive's side footwell cover and trim as necessary. Disconnect APP sensors 6-pin harness connector. Turn ignition on. Check voltage supply at 6-pin harness connector. See **Fig. 26** . See **APP SENSOR VOLTAGE SPECIFICATIONS** table. Turn ignition off. If no voltage is present, go to next step. If voltage tests are okay, erase DTC memory. Test is complete. Perform ECM relearn

procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4.

NOTE: If accelerator pedal assembly is replaced, APP sensors must be adapted to the A/T control module.

Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) or (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between APP sensor circuits and test box sockets. See **APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in APP sensor 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5.

NOTE: APP sensor harness connector terminal No. 5 is for A/T models only.

Replace faulty APP sensors No. 1 (G79) and No. 2 (G185). Accelerator position sensors are an integral part of the accelerator pedal assembly. After repairs, erase DTC memory. Adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1648/18056: DRIVETRAIN DATA BUS MALFUNCTION

Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is

replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Transmission Control Module (J217) and ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Transmission Control Module (J217), ABS Control Module (J104) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 42** , **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms.
4. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1650/18058: DRIVETRAIN DATA BUS - NO SIGNAL FROM INSTRUMENT CLUSTER CONTROL MODULE (J285)

Engine control module communicates with all control modules capable of transferring bus via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface

(J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Instrument Cluster Control Module (J285) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Instrument Cluster Control Module (J285) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 42** , **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1682/18090: DRIVETRAIN DATA BUS - IMPLAUSIBLE SIGNAL FROM ABS CONTROL MODULE (J104)

Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is

replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between ABS Control Module (J104) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 42** , **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms.
4. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1683/18091: DRIVETRAIN DATA BUS - IMPLAUSIBLE SIGNAL FROM AIRBAG CONTROL MODULE (J234)

Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface

(J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Test Procedure

1. Check Air Bag Control Module (J234) for DTC(s). See appropriate AIR BAG RESTRAINT SYSTEMS article under RESTRAINTS. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Air Bag Control Module (J234) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 42** , **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms.
4. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1696/18104: DATA BUS - IMPLAUSIBLE SIGNAL FROM STEERING COLUMN ELECTRONICS

Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: If a test ends with ECM replacement, before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface

(J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Steering Wheel Control Module (J453) DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Steering Angle Sensor (G85), Steering Wheel Control Module (J453) and ECM (J220) for open or short circuits. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL. See **Fig. 42** , **Fig. 43** and **Fig. 44** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms.
4. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Self-Diagnostics - 1.8L Turbo

INTRODUCTION

NOTE: To properly diagnose vehicle, vehicle manufacturer recommends use of Scan Tool (VAG 1551, VAG1552, VAS 5051 or VAS5052) and Test Box (VAG 1598). All voltage tests should be performed with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless specifically stated differently in testing procedures. Ensure ignition switch is in OFF position when performing resistance tests.

Perform a visual inspection, see **VISUAL INSPECTION** . If no faults are found while performing visual inspection, proceed with SELF-DIAGNOSTICS. See **TESTING PROCEDURES** . If no Diagnostic Trouble Codes (DTCs) are present, proceed to appropriate TROUBLE SHOOTING - NO CODES article for diagnosis by symptom (e.g., ROUGH IDLE, ENGINE STALLS).

MODEL IDENTIFICATION

NOTE: Manufacture information for engine codes are inconsistent. There may be overlapping engine codes.

For engine and model identification, see **ENGINE CODES 1.8L TURBO (2002-03)** table.

ENGINE CODES 1.8L TURBO (2002-03)

Model	Engine Code
2002-03	
Beetle	AWV & AWP
GTI	AWP
Jetta	AWP
Passat	AWM

SELF DIAGNOSTIC SYSTEM

CAUTION: Before retrieving DTCs, read all information under title of DIAGNOSTIC TESTS. See DIAGNOSTIC TESTS .

NOTE: When voltage supply to Engine Control Module (ECM) is interrupted, ECM retains Diagnostic Trouble Codes (DTCs), but loses all "learned" and "basic" values. Serious driveability problems may occur depending on vehicle mileage. After reconnecting ECM, it is necessary to perform relearn procedure. See TEST DRIVE RELEARN PROCEDURE .

NOTE: **Read and record DTCs before starting diagnostic work. Some testing procedures will set DTCs.**

NOTE: **Electronic Power Control (EPC) is Volkswagen's name for their electronic throttle drive system. Also referred to as E-Gas System by Volkswagen.**

ECM stores DTCs related to fuel injection, ignition and emissions systems. If a malfunction occurs, it will be indicated by Malfunction Indicator Light (MIL) in instrument cluster, see **MALFUNCTION INDICATOR LIGHT** . DTCs can be read using scan tool connected to Data Link Connector (DLC). DLC is located under left side of instrument panel, see **Fig. 1** .

EPC malfunctions are indicated by EPC warning light and MIL in instrument cluster. DTC(s) relating to EPC system will be stored by ECM. See **ELECTRONIC POWER CONTROL WARNING LIGHT** .

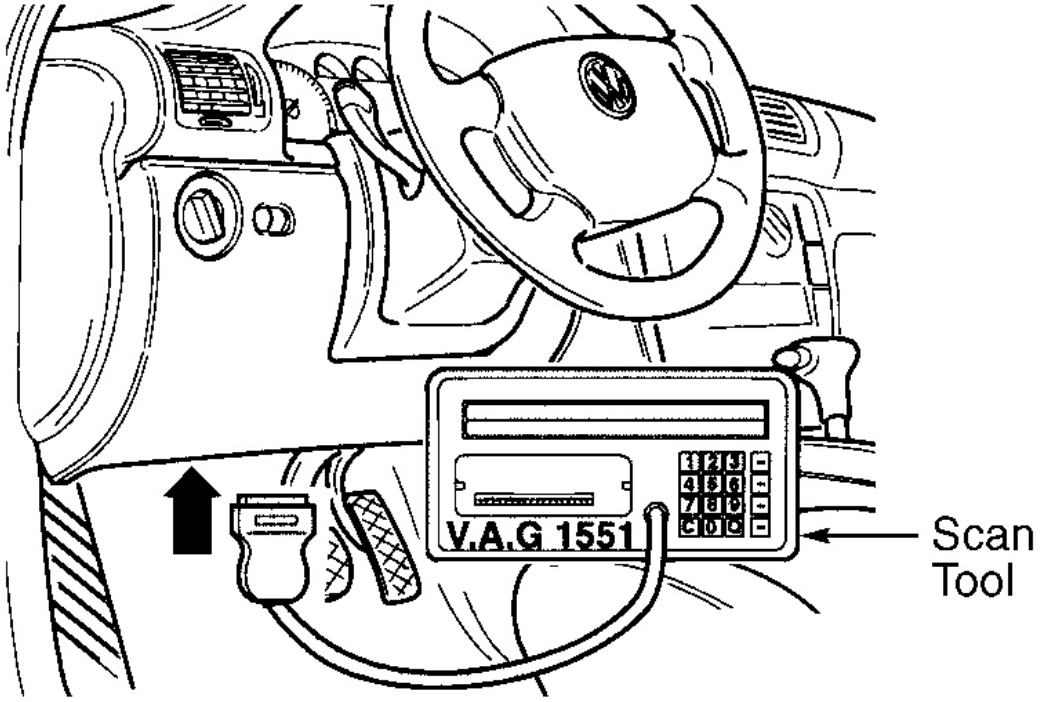


Fig. 1: Locating Data Link Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

SERVICE PRECAUTIONS

WARNING: For safety during road test, it is advisable to have a helper operate tester from rear seat. If test and measuring instruments are operated from front passenger's seat and vehicle is involved in an accident, there is a possibility the person sitting in this seat may receive serious injuries when air bag is deployed.

WARNING: Always use jack stands or hoist safeties when working on a raised vehicle.

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

WARNING: Turbocharger and related components operate at a very high temperature. Always allow system to cool or use proper protective clothing to prevent severe burns.

WARNING: Vehicles with an airbag are fitted with a crash/fuel shut-off. It reduces the risk of a vehicle burning in the event of a crash and that the fuel pump is switched off by the fuel pump relay. At the same time, this device improves the starting of the engine because as soon as the door is opened, the fuel pump is activated to build up pressure in the fuel system. Remove fuel pump fuse before opening fuel system. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

- Read and record DTCs before starting diagnostic work, (some testing procedures will set DTCs).
- Turn ignition off when connecting or disconnecting test equipment, unless specifically instructed not to do so in repair instructions.
- Turn ignition off before connecting or disconnecting ME-SFI control module (ECM - J220) connectors.
- Perform all resistance and voltage tests with a Digital Volt-ohmmeter (DVOM) with minimum 10-megohm impedance, unless stated otherwise in test procedures.
- Ensure ignition switch is in OFF position when performing resistance tests.
- Remove fuel pump fuse before opening fuel system. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.
- Fuel hoses in engine compartment must only be secured by spring type clips.
- When performing an ignition spark test, check one spark plug at a time and ensure spark plug is grounded.
- When performing compression test, remove fuse for fuel injectors and disconnect all 4-pin connectors from ignition coils. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

ON-BOARD DIAGNOSTICS

Misfire

CAUTION: A Malfunction Indicator Light (MIL) flashing in equally timed increments during vehicle operation indicates malfunction(s) causing a misfire. Vehicle must not be driven at full power and must be diagnosed and repaired before catalytic converter damage occurs.

A malfunction that causes a misfire during vehicle operation causes MIL to flash in equally timed increments. This is a malfunction (e.g. misfire) that may cause catalytic converter damage. If MIL flashes in equally timed increments during vehicle operation, cause of malfunction must be determined, see **DTC IDENTIFICATION** table.

Hard Failures

Hard failures cause MIL to illuminate and remain on until problem is repaired. If MIL comes on and remains on during vehicle operation, cause of malfunction must be determined, see **DTC IDENTIFICATION** table. In addition EPC malfunctions are indicated by an EPC warning light and MIL in instrument cluster, see **Fig. 3** and **Fig. 4** under **MALFUNCTION INDICATOR LIGHT (K83)** . For most sensors, if a sensor fails, ECM will use a substitute value in its calculations to continue engine operation. In this condition, commonly known as limp-in or limp-home mode, the vehicle runs but driveability will not be optimum.

The Engine Speed (RPM) sensor (G28) is a speed and reference mark sensor. The engine will not start if there is no speed signal. If the speed signal fails when the engine is running, it will cause the engine to stall immediately.

Sporadic Malfunctions (Intermittent Failures)

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be a loose contact or a intermittently open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTC(s) will be erased from ECM memory. A warm-up phase is, engine started with coolant temperature below 122°F (50°C), and switched off at above 162°F (72°C).

Sporadic malfunctions (intermittent failures) may cause Malfunction Indicator Light (MIL) to flicker or illuminate and go out after the intermittent fault goes away. DTC will be retained in ECM memory. Sporadic malfunctions (intermittent failures) may be caused by a sensor, connector or wiring related problems. If no DTC (s) are present, see INTERMITTENTS in appropriate TROUBLE SHOOTING - NO CODES article.

MALFUNCTION INDICATOR LIGHT (K83)

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA

BUS OBD INTERFACE (J533) CODING .

All models are equipped with a Malfunction Indicator Light (MIL). MIL illuminates when a system failure has been detected and DTC has been stored in Engine Control Module (ECM) memory. For location of MIL, see **Fig. 2** and **Fig. 3** .

MIL and Electronic Power Control (EPC) warning light both illuminate when a system failure has been detected in the EPC system. DTC is also stored in ECM memory.

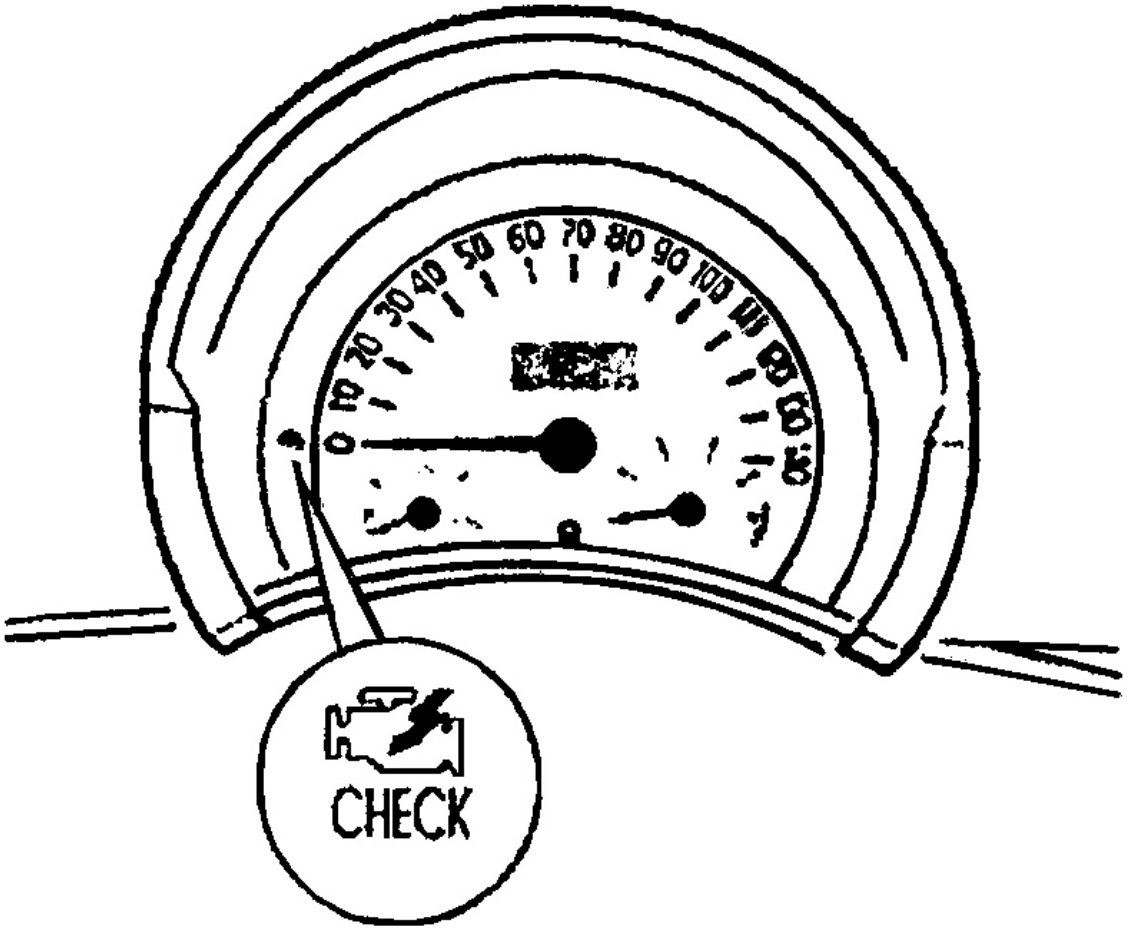


Fig. 2: Locating Malfunction Indicator Light (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

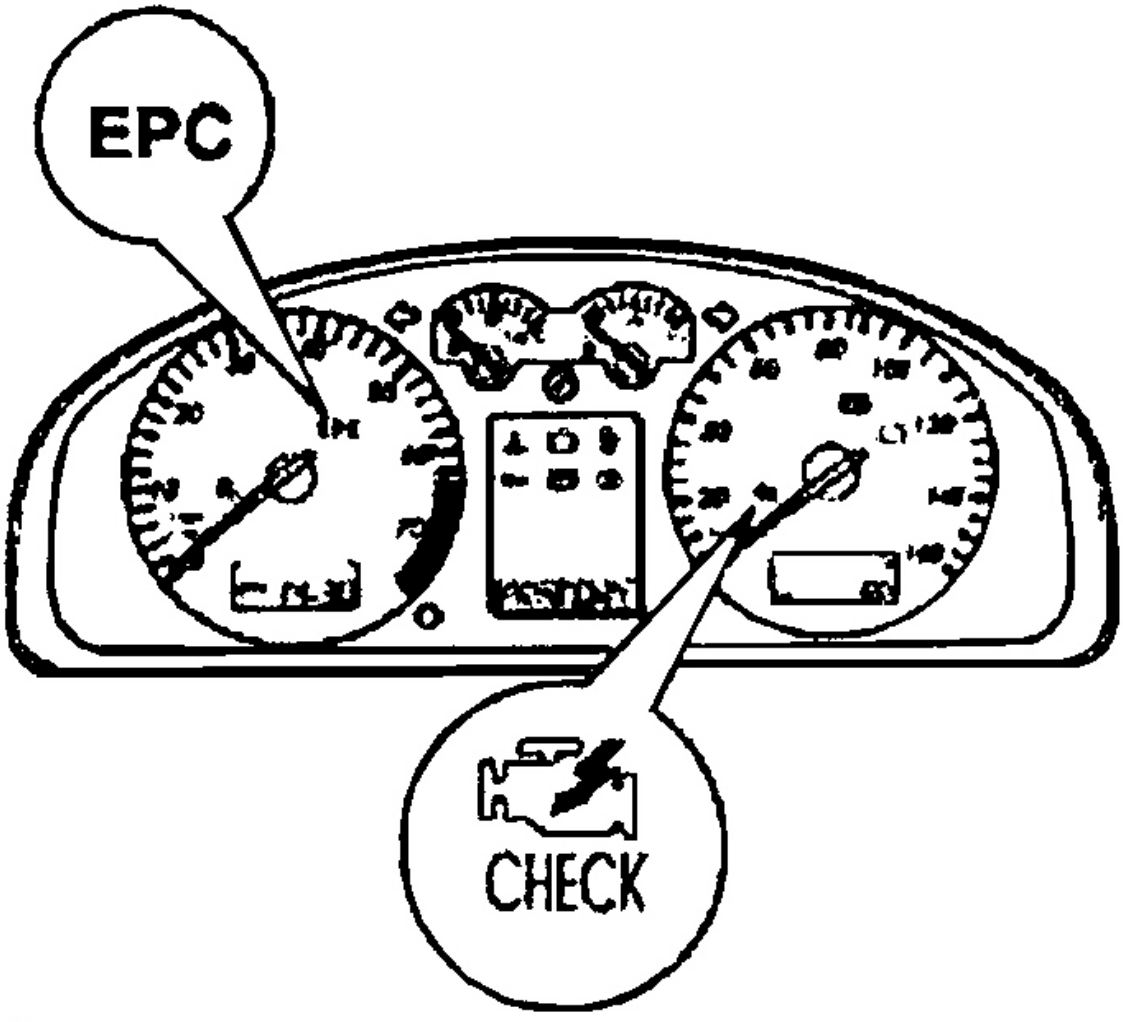


Fig. 3: Locating Malfunction Indicator Light & Electronic Power Control Warning Light (GTI, Jetta & Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

MALFUNCTION INDICATOR LIGHT CHECK

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

With key in the on position, if MIL does not illuminate. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster MIL. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

If MIL is illuminated with engine running, turn engine off. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and

instrument cluster MIL. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

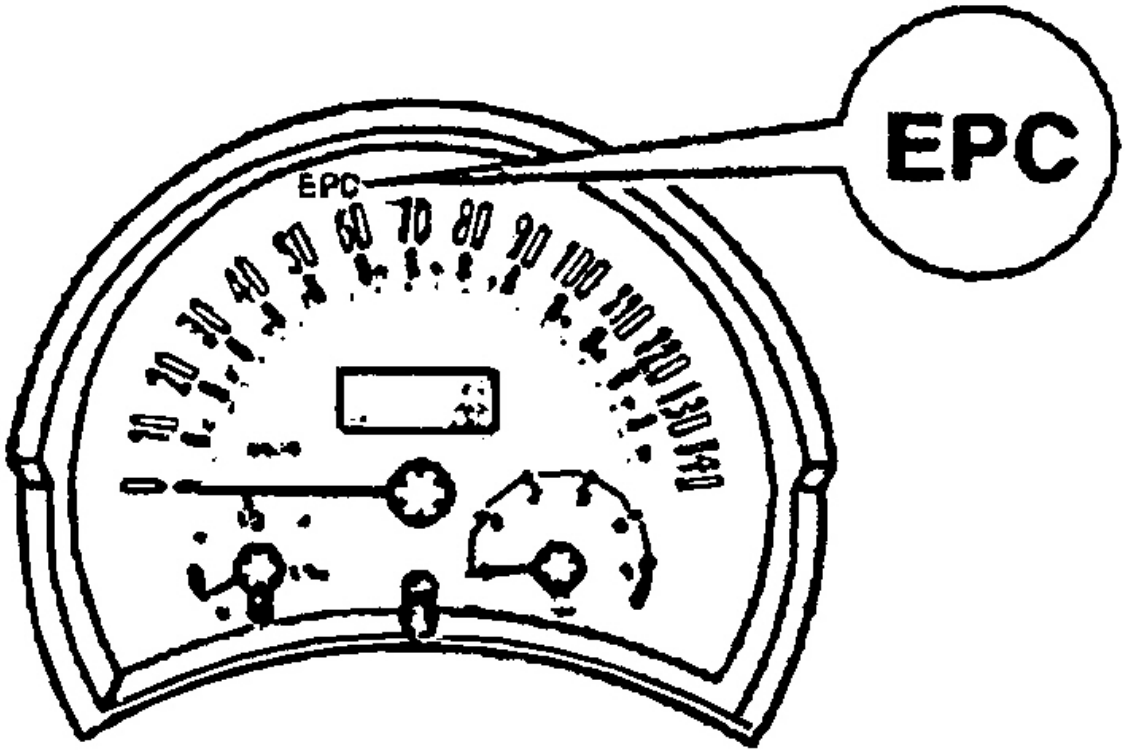
ELECTRONIC POWER CONTROL WARNING LIGHT (K132)

NOTE: Electronic Power Control (EPC) is Volkswagen's name for their electronic throttle drive system. Also referred to as E-Gas System by Volkswagen.

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

Components that make up the EPC system are the ECM and EPC warning light. The Throttle Valve Drive (G186), Angle Sensor 1 for throttle valve drive (G187) and Angle Sensor 2 for throttle valve drive (G188) are an integral part of Throttle Valve Control Module (J338). Accelerator Position Sensor 1 (G79) and Accelerator Position Sensor 2 (G185) are together in 1 unit and are located in accelerator pedal assembly.

MIL and EPC warning light both illuminate when a system failure has been detected in the EPC system. DTC is also stored in ECM memory. For location of EPC warning light, see **Fig. 3** and **Fig. 4** .



G00083383

Fig. 4: Locating Electronic Power Control Warning Light (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

ELECTRONIC POWER CONTROL WARNING LIGHT CHECK

With key in the on position, if EPC does not illuminate. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster for EPC. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

If EPC is illuminated with engine running, turn engine off. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster for EPC. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

TESTING PROCEDURES

Diagnosis of engine control system should be performed in the following order:

1. Perform a visual inspection, see **VISUAL INSPECTION** article. Ensure all engine systems not related to ECM are operating properly. Check for any Technical Service Bulletins (TSBs) that may apply. DO NOT proceed with testing unless all engine problems not related to ECM have been repaired.
2. **NOTE: Read and record DTCs before starting diagnostic work, (some testing procedures will set DTCs).**

   Start engine and check MIL. If MIL flashes, this indicates malfunctions that may cause catalytic converter damage (e.g. misfire). If MIL flashes or stays on, enter diagnostics and determine if DTCs are present. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If DTCs were displayed, determine whether codes are hard or sporadic malfunctions (intermittent codes). Hard codes will cause MIL to illuminate continuously while engine is running. See **ON-BOARD DIAGNOSTICS** .
3. For diagnosing hard codes, proceed to appropriate DTC test. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . When diagnosing sporadic malfunctions (intermittent codes), using Scan Tool VAG 1551/1552 or VAS 5051/5052 most sporadic malfunctions (intermittent codes) will display with /SP (sporadic malfunction) after code. If there is a driveability problem and MIL comes on and than goes off, but no code is stored, proceed to INTERMITTENTS in appropriate TROUBLE SHOOTING - NO CODES article.
4. If MIL stays on, and no DTCs are present, or if MIL does not come on, check MIL. See **MALFUNCTION INDICATOR LIGHT CHECK** .
5. If no DTCs are present and a driveability problem exists, refer to INTERMITTENTS in appropriate TROUBLE SHOOTING - NO CODES article. Doing so will help identify proper system or component to check. See appropriate SYSTEM & COMPONENT TESTING article for diagnosis of faulty component.
6. After necessary repairs are made, perform ECM test drive relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

VISUAL INSPECTION

Prior to retrieving DTCs, perform a comprehensive visual inspection of underhood components. Check ground connections located on intake manifold, ground cable between engine and vehicle body and that battery cables are clean and tight. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

Check vacuum hoses for breakage and blockage. Check electrical wiring and harness connectors for damage and corrosion. Repair as necessary. Ensure all engine systems not related to ECM are operating properly. Check for any Technical Service Bulletins (TSBs) that may apply. DO NOT proceed with testing unless all engine problems not related to ECM have been repaired. Go to step 2 under TESTING PROCEDURES.

RETRIEVING DIAGNOSTIC TROUBLE CODES

NOTE: Read and record DTCs before starting diagnostic work, some testing procedures will set DTCs. If no DTCs are stored, do not erase memory, erasing DTC memory will cause readiness code to be erased. If ignition is switched off between "Retrieving Diagnostic Trouble Codes" and "Clearing Diagnostic Trouble Codes" the DTC memory will not be erased, repeat "Retrieving Diagnostic Trouble Codes" procedure.

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like e.g. harness connector disconnected). See AUTOMATIC TEST SEQUENCE .

NOTE: Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Generic scan tool may not be able to perform all test functions. If engine does not start, (this test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052). Connect scan tool. Operate starter for approximately 6 seconds, do not switch ignition off. Turn on scan tool printer. Operate scan tool, according to scan tool display information. Check for DTCs.

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be a loose harness connector or an intermittently open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTCs will be erased from ECM memory. A warm-up phase is, engine started with coolant temperature below 122°F (50°C) - switched off at above 162°F (72°C).

Generic Scan Tool

1. Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for reading DTCs. To identify DTCs, see **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . If no DTCs are present and driveability problem exists, refer

to INTERMITTENTS in appropriate TROUBLE SHOOTING - NO CODES article. Doing so will help identify proper system or component to check. See appropriate SYSTEM & COMPONENT TESTING article for diagnosis of faulty component.

2. After performing DTC checks and repair work, malfunctions may be present in other control modules, e.g. harness connector disconnected. DTC memories of all control modules must be checked and erased. See **AUTOMATIC TEST SEQUENCE** .

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Start engine and idle.
2. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, start engine and press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "2" for "Check DTC memory" and enter by pressing "Q" key. If DTCs are present, record or print DTCs. Press keys "0" and "5" for function "Erase DTC memory" and enter by pressing "Q" key. Press right arrow key, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. To identify DTCs, see **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary. If no DTCs are present "No DTC recognized" will display. Press right arrow key, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. If a driveability problem exists, refer to INTERMITTENTS in appropriate TROUBLE SHOOTING - NO CODES article. Doing so will help identify proper system or component to check. See appropriate SYSTEM & COMPONENT TESTING article for diagnosis of faulty component.
3. After performing DTC checks and repair work, malfunctions may be present in other control modules, e.g. harness connector disconnected. DTC memories of all control modules must be checked and erased. For generic scan tools, follow scan tool manufacturer's instruction to check and erase DTCs (this procedure is called Automatic Test Sequence when using Scan Tool VAG 1551/1552 or VAS 5051/5052). See **AUTOMATIC TEST SEQUENCE** .
4. If no DTCs are present or after clearing diagnostic trouble codes from all control modules, perform a long road test. Coolant temperature needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive, must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. After road test recheck all control modules for DTCs. If DTCs are present, repair as necessary. Clear codes. See **CLEARING DIAGNOSTIC TROUBLE CODES** . Verify repairs. Test is complete.

CLEARING DIAGNOSTIC TROUBLE CODES

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like e.g. harness connector disconnected). See AUTOMATIC TEST SEQUENCE .

NOTE: If ignition is switched off between "Retrieving Diagnostic Trouble Codes" and "Clearing Diagnostic Trouble Codes" the DTC memory will not be erased, repeat "Retrieving Diagnostic Trouble Codes" procedure.

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for clearing DTCs.

Scan Tool VAG 1551/1552 Or VAS 5051/5052

1. Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . DTCs must be read before being erased, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
2. Start engine and press keys "0" and "1" for address word "Engine Electronics", press keys "0" and "5" for function "Erase DTC memory" and enter by pressing "Q" key. Press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.

AUTOMATIC TEST SEQUENCE

NOTE: It is recommended that all control modules in the CAN Data Bus are checked for DTCs before starting and after performing DTC testing and repair work (during test and assembly work malfunctions can be recognized from other control modules like e.g. harness connector disconnected). Automatic Test Sequence is function 00 when using Scan Tool VAG 1551/1552 or VAS 5051/5052.

Generic Scan Tool

Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** . Follow scan tool manufacturer instructions for entering AUTOMATIC TEST SEQUENCE.

Scan Tool VAG 1551/1552 or VAS 5051/5052

1. Turn ignition off. Connect scan tool to diagnostic connector located under left side of dashboard. See **Fig. 1** .
2. To enter Automatic Test Sequence, press "0" key 2 times for address word "Automatic test sequence" and enter by pressing "Q" key. VAG 1551/1552 or VAS 5051/5052 communicates with all control modules in CAN Data Bus. Any DTCs that are stored will be displayed or "No DTC recognized" will display for each control module one after another. Automatic test sequence has ended when, "VAG On Board Diagnostic HELP 1 - Rapid data transfer 2 - Blink code output" is displayed. Erase DTCs, see **CLEARING DIAGNOSTIC TROUBLE CODES** . Perform test drive, see **TEST DRIVE RELEARN PROCEDURE** . Go to next step.
3. If no DTCs are stored after test drive, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. If DTC(s) are stored in a control module in CAN Data Bus, see appropriate DTC table and diagnostic procedure, (e.g. ABS DTC IDENTIFICATION table, under BRAKES/Anti-Lock/Traction Control article, if ABS DTC is stored). Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform test drive, see **TEST DRIVE RELEARN PROCEDURE** .

TEST DRIVE RELEARN PROCEDURE

NOTE: When voltage supply to ECM is interrupted or codes have been cleared, ECM loses all "learned" and/or "basic" values. Serious driveability problems may occur depending on vehicle mileage. A relearn procedure must be performed.

1. If ECM was disconnected during diagnostic procedure or codes have been cleared, go to next step. If ECM was not disconnected during diagnostic procedure and no codes are present. Perform a test drive. Recheck for codes (no relearn procedure is necessary).
2. Turn ignition off. Remove test equipment. Reconnect ECM connector. Reconnect all remaining (disconnected) electrical connectors/components. Go to next step.
3. **NOTE: Throttle Valve Control Module (J338) adapts to ECM (J220) automatically if ignition is switched on for 10 seconds or more without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.**

   Turn ignition on for a minimum of 10 seconds. Turn ignition off. Perform idle check, see **IDLE CHECK** . Perform a long road test. Coolant temperature needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive, all must be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. Read readiness code. Generate readiness code if necessary. See **READINESS CODE** .

READINESS CODE

NOTE: On Beetle, GTI and Jetta, Throttle Valve Control Module (TVCM - J338) adaptation is part of Readiness Code procedures. TVCM (J338) adaptation can also be performed by it self, see THROTTLE VALVE CONTROL MODULE .

NOTE: Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Not all eight diagnostic functions in Readiness Code are used. See Fig. 5 . It is recommended that readiness code be read and that readiness code be generated (if necessary) before performing smog check to guarantee that emission relevant systems function correctly. Generate readiness code after performing repairs on exhaust emission systems in order to guarantee that these systems function correctly. If a malfunction is detected during diagnostic, malfunction will be entered in DTC memory.

Readiness Code Description

Readiness code must be generated when ECM memory is cleared, ECM loses battery voltage or is replaced. Readiness Code appears as an 8-digit display after entering function 15 (display Readiness Code function) on scan tool (Scan Tool VAG 1551/1552 or VAS 5051/5052). Each of the 8 digits is related to a specific exhaust emissions related system (not all 8 exhaust emission related systems are checked when ECM generates Readiness Code, see **Fig. 5** and some exhaust emission related systems that are not part of Readiness Code are checked). During a test sequence OBD system checks function of each emissions relevant exhaust system. OBD system checks components and generates Readiness Code at regular intervals during normal driving. See **GENERATING READINESS CODE** .

Reading Readiness Code

NOTE: **Before reading readiness code, perform a long road test. Coolant temperature needs to be greater than 176° F (80° C). Idle, partial throttle, full throttle and overdrive, must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. OBD system checks components and generates Readiness Code at regular intervals during normal driving. See Generating Readiness Code . Readiness code is erased if DTC memory is erased or voltage supply to ECM is lost.**

Generic Scan Tool - To read readiness code, connect scan tool to DLC. DLC is located left side of steering column. See **Fig. 1** . Follow scan tool manufacturer's instructions and read Readiness Code. See **Fig. 5** . Readiness code should display -0 0 0 0 0 0 0 0-. If readiness code does not display as specified, generate Readiness Code. See **Generating Readiness Code** .

Scan Tool VAG 1551/1552 Or VAS 5051/5052 - To read readiness code, connect scan tool to DLC. DLC is located left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics", press keys "1" and "5" for "Readiness code" and enter by pressing "Q" key. Read Readiness Code. See **Fig. 5** . Readiness Code should display -0 0 0 0 0 0 0 0-. If readiness code does not display as specified, press right arrow key and generate Readiness Code. See **GENERATING READINESS CODE** . If Readiness Code displays as specified, Readiness Code diagnostics are complete and no further Readiness Code diagnostics are necessary, press keys "0" and "6" for function "End Output" and enter by pressing "Q" key.

Test Requirements For Generating Readiness Code

Ensure throttle valve is not damaged or dirty. Throttle valve angle must be less than 10 degrees. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Generating Readiness Code

There are two ways to generate Readiness Code:

1. By performing a long road test. Coolant temperature needs to be greater than 176°F (80°C). Idle, partial throttle, full throttle and overdrive, must all be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM. This initiates necessary relevant exhaust emission diagnostics and Readiness Code is then generated when ECM verifies readiness of tested exhaust emission components (Readiness Code is generated at regular intervals during normal driving). Read readiness code. See **READING READINESS CODE** . If Readiness Code displays -0 0 0 0 0 0 0 0-, Readiness Code was generated on test drive and no further Readiness Code dignostics are necessary.
2. By using scan tool. See **GENERATING READINESS CODE (GENERIC SCAN TOOL)** or **GENERATING READINESS CODE (SCAN TOOL VAG 1551/1552 OR VAS 5051/5052)** .

WARNING: **When working on vehicles ensure that parking brake is set and transmission is in park (A/T) or neutral (M/T). For safety during road test,**

it is advisable to have a helper operate or observe scan tool from rear seat. If test and measuring instruments are operated from front passenger's seat and vehicle is involved in an accident, there is a possibility the person sitting in this seat may receive serious injuries when air bag is deployed.

NOTE: If ignition is turned off at any time while Generating Readiness Code, Readiness Code will not be generated. When DTC memory is erased or ECM looses power Readiness Code is also erased.

NOTE: During readiness code generating procedure, if test result is indicated as "OK" after selecting a display group, testing has already been carried out and it is okay to proceed to next work step.

Generating Readiness Code (Generic Scan Tool)

1. If possible it is best to warm-up vehicle by test driving. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** .
2. Follow scan tool manufacturer's instructions and generate Readiness Code. See **Fig. 5** . Readiness code should display -0 0 0 0 0 0 0 0-. If readiness code does not display as specified, generate Readiness Code.

Generating Readiness Code (Scan Tool VAG 1551/1552 Or VAS 5051/5052)

1. If during a Work Step test result "OK" is indicated immediately after a display group was selected, test is finalized already. Proceed with next work step. When Generating Readiness Code and going from one Work Step to the next, DO NOT move ignition key into off position.
2. If possible it is best to warm-up vehicle by test driving. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Using scan tool, retrieve DTCs. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If DTCs are stored. Repair as necessary. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . If no DTCs are stored, press right arrow key.
3. Using scan tool, clear DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES** . After clearing codes, press right arrow key.
4. Adapt Throttle Valve Control Module (J338). See **ADAPTING THROTTLE VALVE CONTROL MODULE (J338) TO ECM (J220)** . Go to next step.
5. Start engine and idle. DO NOT move ignition key into off position during remaining steps.
6.

   NOTE: There must be no load on engine for EVAP Leak Detection diagnostic to function. If "TVV n.OK" and/or "Syst. n.OK" displays in "Specified value" window in display field 4, check for DTCs. See DIAGNOSTIC TROUBLE CODE IDENTIFICATION . Repair as necessary.

   EVAP Leak Detection - Allow engine to run at idle. Press keys "0", "7" and "0" for display group 70 and enter by pressing "Q" key. When diagnostic test for EVAP Leak Detection is initiated, display field 4 will change from "Test OFF" to "Test ON". Allow engine to run at idle until display field 4 changes to "TVV

OK". If "TVV OK" displays in "Specified value" window of display field 4, press "3" key (VAG 1551), up arrow (VAG 1552, VAS 5051 and VAS 5052) for Display group 071. Allow engine to run at idle for 30 seconds, display field 4 should change from "Test OFF" to "Test ON". Allow engine to run at idle until "Specified value" in display field 4 changes to "Syst. OK". If "Syst. OK" is displayed, press right arrow key and check next component. If display field 4 changes from "Test ON" to "Test OFF"during EVAP Leak Detection and "Abort" displays in display field 2, open and retighten fuel filler cap and repeat EVAP Leak Detection diagnostic. DO NOT move ignition key into off position.

7. **HO2 Sensor Aging (Cycle Duration Monitor) -** Allow engine to run at idle. Press keys "0" and "8" for "Read Measuring Value Block" and enter by pressing Q key. Press keys "0", "3" and "4" for display group 34 and enter by pressing "Q" key. Set engine speed to 1800-2500 RPM using pedal prop. Maintain 1800-2500 RPM until display field 2 increases to above 665° F (352° C), (this may take a few minutes). Continue to maintain 2200-2800 RPM until "B1-S1 OK" appears in display field 4. If "B1-S1 OK" is displayed in display field 4, press "C" key and go to next step. If "B1-S1 OK" is not displayed in display field 4, check for DTCs. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.
8. **Secondary Air Injection -** Allow engine to run at idle. Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press keys "0", "7" and "7" for display group 77 and enter by pressing "Q" key. When diagnostic test for Secondary Air Injection (AIR) System is initiated, display field 4 will change from "Test OFF" to "Test ON". Allow engine to run at idle until display field 4 changes to "Syst. OK". If "Syst. OK" displays in "Specified value" window of display field 4, AIR System is okay. Press "C" key and check next component. If "Syst. n.OK" is displayed, AIR System is not okay. Check for DTCs. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.
9.

   NOTE: Diagnostic of TWC takes approximately 100 seconds. If there is still no result in the display after 150 seconds, change engine speed within 1800-2500 RPM range.

   TWC Diagnostic - Allow engine to run at idle. Press keys "0", "4" and "6" for display group 46 and enter by pressing "Q" key. Set engine speed to 1800-2500 RPM using pedal prop. Maintain 1800-2500 RPM until TWC temperature in display field 2 increases to above 665° F (352° C) and "Test OFF" changes to "Test ON" in display field 4. Continue to maintain 1800-2500 RPM until "Cat B1 OK" appears in display field 4. Press right arrow key. Press keys "0", and "6" for function "End Output" and enter by pressing "Q" key. If "Cat B1 OK" is not displayed in display field 4, check for DTCs. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary. If "Cat B1 OK" is displayed in display field 4. Turn ignition off.
10. **Read Readiness Code -** See **READING READINESS CODE** .

The readiness code is generated only when all display zones show 0								
1	2	3	4	5	6	7	8	Diagnostic function
							0	Catalyst
						0		Catalyst heating (currently no diagnostic/always "0")
					0			Evaporative Emission (EVAP) system (tank venting system)
				0				Secondary air system (not fitted/always "0")
			0					Air conditioner (currently no diagnostic/always "0")
		0						Oxygen sensors
	0							Oxygen sensor heating
0								Exhaust gas recirculation system (not fitted/always "0")

G00083380

Fig. 5: Identifying Readiness Code
Courtesy of VOLKSWAGEN UNITED STATES, INC.

IDLE CHECK

1. Before checking idle. There must be no exhaust leaks in between cylinder head and catalytic converter. Coolant temperature needs to be greater than 176°F (80°C). Battery voltage needs to be greater than 11.5 volts. All electrical consumers and A/C need to be switched off. Vehicle in park or neutral, with parking brake on.
2. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Start engine and idle. Using scan tool check for DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If any DTCs are present, repair as necessary and clear codes, see **CLEARING DIAGNOSTIC TROUBLE CODES** .
3. Briefly increase engine RPM to 3500 and let idle for two minutes. Using scan tool, follow scan tool manufacturer instructions to check idle speed. See **IDLE SPECIFICATIONS** table.

IDLE SPECIFICATIONS

Model	Engine Code	RPM
Beetle	AWV	640-820
Beetle A/T	APW	640-760
Beetle M/T	APW	700-840
GTI A/T	APW	640-760
GTI M/T	APW	700-840
Jetta A/T	APW	640-760
Jetta M/T	APW	700-840
Passat	AWM	740-920

IDLE SPEED ADJUSTMENT

NOTE: **In exceptional circumstances (e.g. customer complaints concerning droning noises and/or vibrations at idling speed), it is permitted to adjust idling speed slightly. Ensure that idling speed is not outside the specified idling range. (If the speed is outside tolerance range it is possible that vehicle will fail the next exhaust emissions test).**

Using scan tool, follow scan tool manufacturer's instructions to adjust idle speed. Using scan tools VAG 1551/1552 or VAS5051/5052 this is done in Adaption/Channel 1 VAG 1551 keys 1 and 3 moves RPM up or down in 10 RPM increments. VAG 1552, VAS 5051 or VAS 5052 uses up and down arrows to move RPM up or down in 10 RPM increments. See **IDLE SPECIFICATIONS** table. Initiate A/T basic setting, see **A/T BASIC SETTING** .

ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE

Mixture Self-Adaptation

The Motronic ME-SFI engine control system regulates air/fuel mixture at a constant 14.7:1 under all engine operating conditions. System automatically compensates for engine wear, injector wear, minor air leaks, and to some degree inaccurate sensors. This automatic control has upper and lower compensating limits. When a lower limit is not reached or an upper limit is exceeded a DTC is set.

The amount of correction is constantly calculated and permanently stored. After a repair, Motronic ME-SFI control module will automatically adapt again.

Removal & Installation

1. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
2. To remove ECM see specific model below:

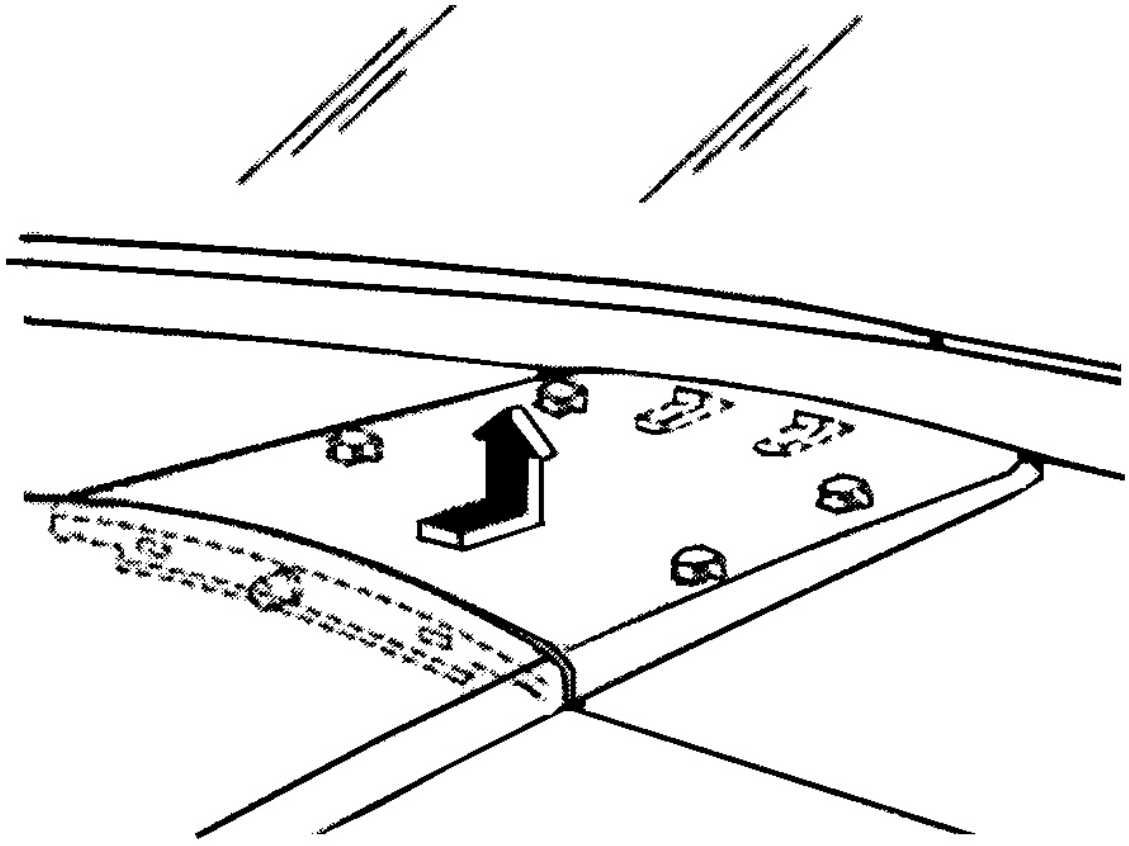
   Beetle
   Turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

   GTI & Jetta
   Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

   Passat
   Turn ignition off. ECM is located at left rear of engine compartment. Remove ECM protective cover and retaining bracket, see **Fig. 7** . Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.
3. After installing ECM perform following procedures:
   - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC**

TROUBLE CODES .

- Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
- On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
- On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
- On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
- On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
- Perform idle check. See **IDLE CHECK** .
- Generate ECM readiness code. See **READINESS CODE** .



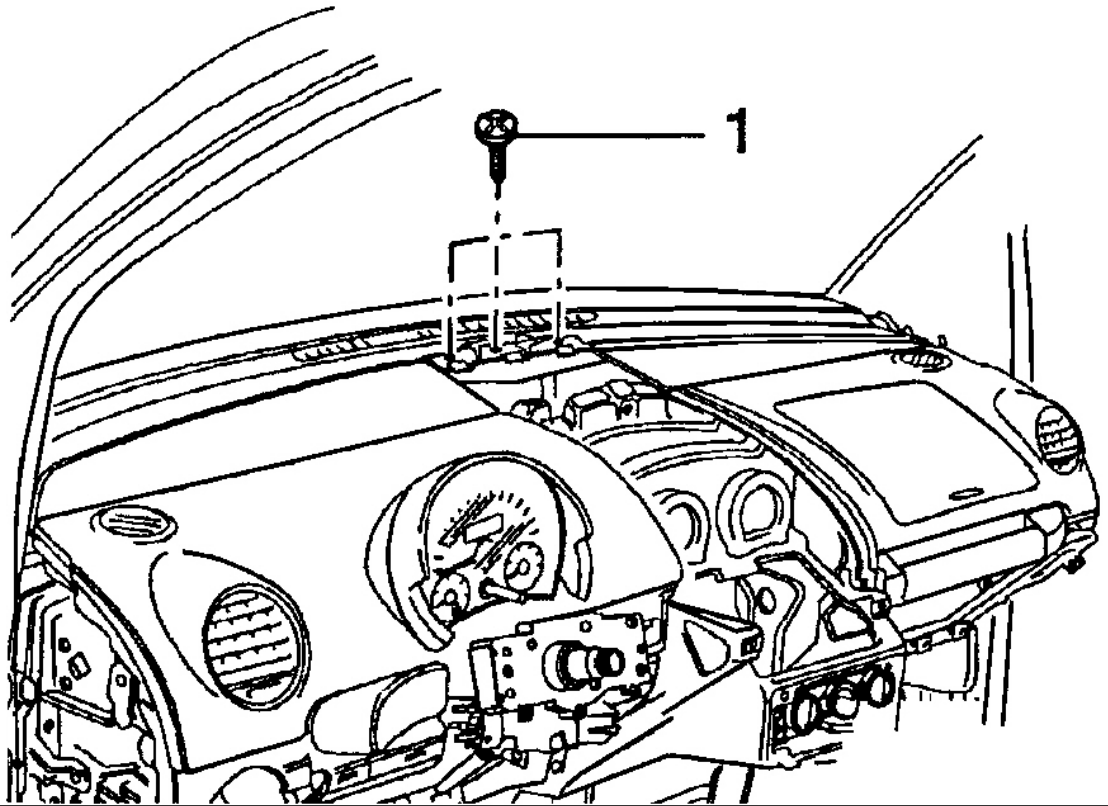
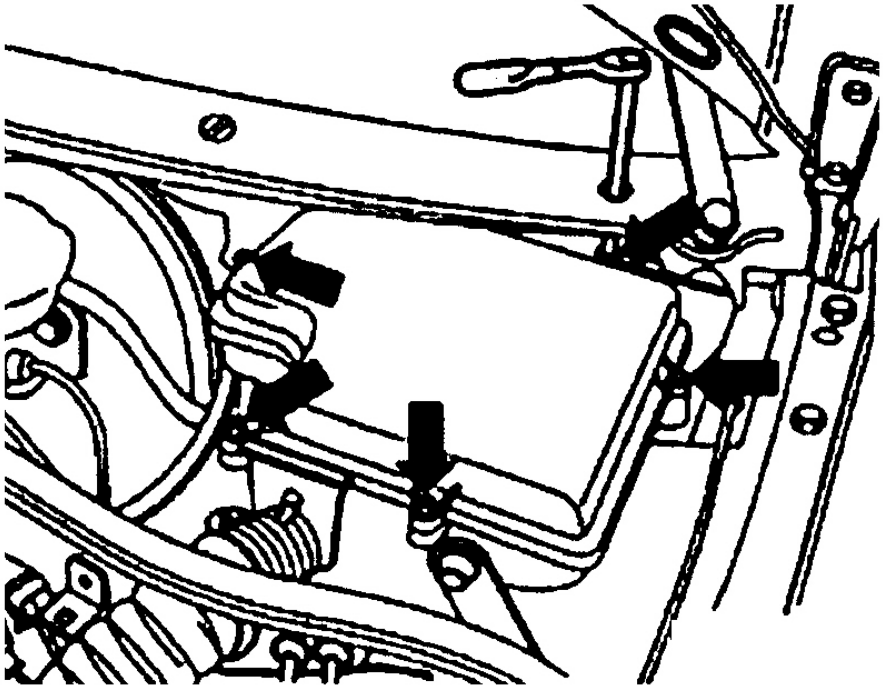
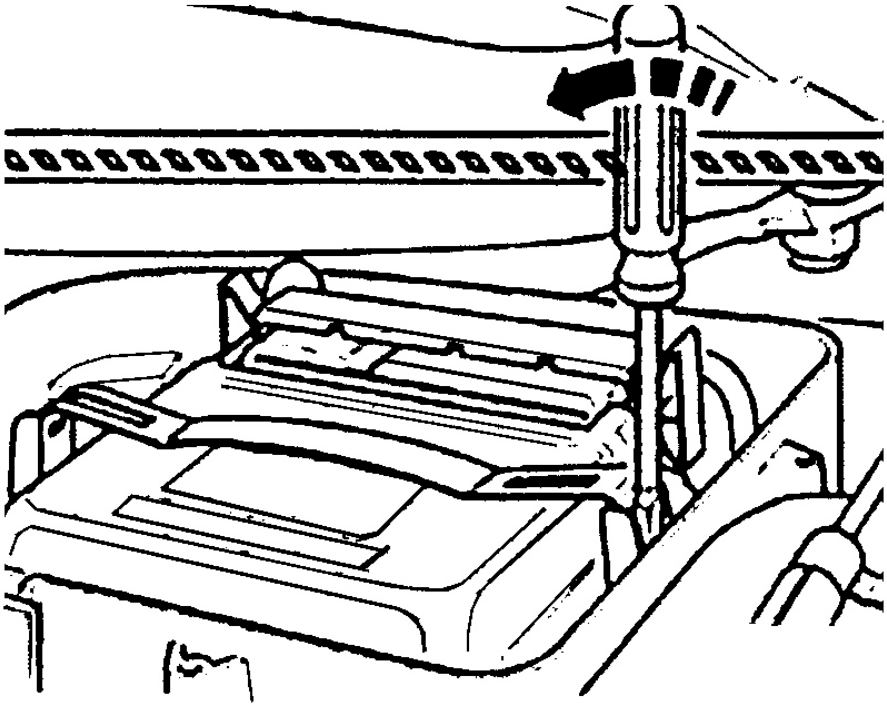

1

Fig. 6: Removing Center & Left Inner Dash Covers (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.





G00083390

Fig. 7: Removing ECM Protective Cover & Bracket (Passat)

Courtesy of VOLKSWAGEN UNITED STATES, INC.

ECM Ground & Voltage Supply

NOTE: Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052). The following tests are preformed using Scan Tool (VAG 1551/1552 or VAS 5051/5052). For location of Data Link Connector (DLC), see RETRIEVING DIAGNOSTIC TROUBLE CODES .

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure battery and engine to body grounds are okay. Repair as necessary. Turn off all electrical consumers and A/C. Position shift lever in park (A/T) or neutral (M/T) and set parking brake. Connect scan tool. See **Fig. 1** .
2. Start engine and idle. Press keys "0" and "1" for address word "Engine Electronics". Press keys "0" and "8" for "Read Measuring Value Block" function 08 and enter by pressing "Q" key. Press keys "0", "0" and "4" for display group "4" and enter by pressing "Q" key. Read ECM voltage supply in "Specified value" window of display field "2". Press right arrow key and enter by pressing "Q" key. ECM voltage supply should be 12-14.5 volts. Turn ignition off. If voltage is less than 12 volts, go to next step. If voltage is more than 14.5 volts, go to step 4 . If voltage checks are okay. ECM power and ground circuits are okay. Test is complete.
3. Check battery, alternator, parasitic load and ECM grounds. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. If repairs where performed, repeat steps 1 and 2 . If battery, alternator, parasitic load and ECM grounds are okay, go to step 5 .
4. Possible cause is alternator and/or voltage regulator failure. Repair as necessary. If repairs were performed, repeat steps 1 and 2 . If alternator and voltage regulator are okay, go to next step.
5. Turn ignition off. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** and go to next step.
6. **NOTE: If test box is not available. Use wiring diagram and DVOM to check ECM grounds and voltage supply, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.**

   Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and DVOM. Measure voltage supply at test box sockets No. 1 and 62 (ground and B+ 30). Battery voltage should be present. Measure voltage supply at test box sockets No. 2 and 3 (ground and ignition 15). Battery voltage should be present. If either voltage tests have failed, for all models (except Beetle engine code AWV) go to next step. For Beetle (engine code AWV), go to step 8 . If both voltage checks are okay. ECM power and ground circuits are okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. **Except Beetle (Engine Code AWV)**
   Check voltage supply through ECM power supply relay. Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and a DVOM, measure voltage supply at test box sockets No. 2 and 121. Battery voltage should be present. Check continuity of wire from terminal No. 21 at ECM to ECM power supply relay No. 5, (No. 4 on relay for Passat). If any voltage tests have failed, go to next step. If voltage and

continuity checks are okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

8. **Beetle (Engine Code AWV)**
   Check wiring connections on relay panel. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. Verify repairs. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

OUTPUT DIAGNOSTIC TEST MODE

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool in Output Diagnostic Test Mode to activate engine components, some components may be barely audible. Check component by touch or use mechanics stethoscope if necessary.

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Using scan tool, follow scan tool manufacturer's instructions to perform Output Diagnostic Test Mode. Output Diagnostic Test Mode activates the following components in sequence:

1. EVAP Canister Purge Valve (N80)
2. Secondary Air Injection Valve (N112)
3. Secondary Air Injection Pump Relay (J299)
4. Wastegate Bypass Regulator Valve (N75)
5. Camshaft Adjustment Valve (N205)
6. EVAP Leak Detection Pump (V144)
7. Recirculating Valve For Turbocharger (N249), except Passat
8. Brake System Vacuum Pump (V192), A/T - except Beetle
9. Injector, Cylinder 1 (N30), except Beetle
10. Injector, Cylinder 2 (N31), except Beetle
11. Injector, Cylinder 3 (N32), except Beetle
12. Injector, Cylinder 4 (N33), except Beetle

DRIVE CYCLES

NOTE: For Test Drive Relearn Procedure and Readiness Code. See TEST DRIVE RELEARN PROCEDURE and READINESS CODE . If emission related repairs have been performed or vehicle is to be smog checked, it is recommended that

readiness code be read and readiness code be generated if necessary. See READINESS CODE .

Warm-Up Phase
Engine started with coolant temperature below 122°F (50°C) - switched off at above 162°F (72°C).

Road Test
Coolant temperature needs to be greater than 176°F (80°C). Idle, partial throttle, full throttle and overdrive, all must be attained several times. During test drive, apply full throttle until engine speed exceeds 3500 RPM.

PROGRAMMING

ENGINE CONTROL MODULE (J220) CODING

1. Connect scan tool to Data Link Connector (DLC). See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
2. Following scan tool manufacturer's instructions, access coding information from Engine Control Module (ECM - J220) that is to be replaced, print or record code. Enter code into new ECM as necessary.
3. For ECM coding options, see **ECM CODING OPTIONS (GTI & JETTA)** table or **ECM CODING OPTIONS (PASSAT)** table.
4.

NOTE: After coding ECM and starting engine for first time, allow engine to idle for several minutes so ECM can go through learn function. Idle speed may be erratic while ECM is learning.

If Engine Control Module (ECM) is replaced, it is necessary to code new ECM. If new ECM is not properly coded, the following problems may occur:

- Driveability problems (e.g., harsh shifting).
- False malfunctions stored in ECM memory.
- Increased fuel consumption.
- Increased exhaust emissions.
- Reduction in transmission life.
- All ECM functions are not carried out (e.g., EVAP system operation).
- On front wheel drive vehicles anti-slip regulation (ASR), ASR warning lamp comes on.

ECM CODING (BEETLE)

Application	Code
A/T	00003
M/T	00001

ECM CODING OPTIONS (GTI & JETTA)

Application/Code	Option
Country/Emissions	
06	(1)
07	(2)
Drive/Additional Functions	
0	Front Wheel Drive
2	All Wheel Drive
4	All Wheel Drive Without Anti-Slip Regulation (ASR), Data Bus
5	Front Wheel Drive With Anti-Slip Regulation (ASR), Data Bus
6	All Wheel Drive Without Anti-Slip Regulation (ASR), Data Bus
7	All Wheel Drive With Anti-Slip Regulation (ASR), Data Bus
Transmission	
0	5-Speed Manual Transmission
1	6-Speed Manual Transmission
3	Automatic Transmission 01M
5	Automatic Transmission 09A
Vehicle Type	
0	A-Class e.g. GTI

(1) USA model with Transitional Low Emissions Vehicle (TLEV) specifications.

(2) USA model with Low Emissions Vehicle (LEV) specifications.

ECM CODING OPTIONS (PASSAT)

Application/Code	Option
Country/Emissions	
07	(1) USA LEV
16	(2) USA ULEV
Drive/Additional Functions	
0	Front Wheel Drive Without Anti-Slip Regulation (ASR)
2	All Wheel Drive Without Anti-Slip Regulation (ASR)
5	All Wheel Drive With Anti-Slip Regulation (ASR)
7	All Wheel Drive With Anti-Slip Regulation (ASR)
Transmission	
0	5-Speed Manual Transmission
1	6-Speed Manual Transmission
5	Automatic Transmission 01V (Tiptronic)
Vehicle Type	
1	B-Class e.g. Passat

(1) USA export model with Low Emissions Vehicle (LEV).

(2) USA export model with Ultra Low Emissions Vehicle (ULEV).

Passat:				1
5-speed manual transmission:			0	
Front Wheel Drive (FWD) with ASR:		5		
Exhaust concept:	07			
Code number:	07	5	0	1

G00083389

Fig. 8: ECM Code Numbering Description
Courtesy of VOLKSWAGEN UNITED STATES, INC.

CAN DATA BUS OBD INTERFACE (J533) CODING

NOTE: **Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wires twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.**

NOTE: **Can Data Bus OBD Interface (J533) is also referred to as "Gateway" by Volkswagen. Can Data Bus OBD Interface (J533) is an integral part of Instrument Cluster Control Module (J285). Can Data Bus OBD Interface (J533) must be coded independently of Instrument Cluster Control Module (J285). From model year 2001, it is not necessary to enter coding for Transmission Control Module (J217), when coding Can Data Bus OBD Interface (J533). From model year 2002, Comfort System Central Control Module (J393) is integrated into Can Data Bus, it is not necessary to enter coding for Comfort System Central Control Module (J393).**

NOTE: **Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052). For location of Data Link Connector (DLC), see RETRIEVING DIAGNOSTIC TROUBLE CODES .**

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. If using other than Scan Tool (VAG 1551/1552 or VAS 5051/5052), follow scan tool manufacturer's instructions. Using Scan Tool (VAG 1551/1552 or VAS 5051/5052), select address word 19, select function 7, enter 00006 (ABS activated 00002 + Airbag activated 00004 = 00006).

THROTTLE VALVE CONTROL MODULE (J338)

NOTE: Throttle Valve Control Module (TVCM - J338) teaches ECM various positions of throttle valve when ignition is on and engine is not running. Throttle positions are stored in the ECM. Throttle position is communicated to ECM through two angle sensors, Angle sensor 1 for throttle valve drive (G187) and Angle sensor 2 for throttle valve drive (G188), sensors are integral parts of the TVCM (J338). Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052.

Adapting Throttle Valve Control Module (J338) To ECM (J220)

NOTE: When adaptation of throttle valve control module is necessary and vehicle is equipped with A/T, the transmission control module must also be adapted. Perform adaptation of A/T to its Basic Setting. See A/T BASIC SETTING .

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 60, (VAG 1551/1552 or VAS 5051/5052). See step 1 under Adapting Throttle Valve Control Module (Scan Tool VAG 1551/1552 Or VAS 5051/5052). If using generic scan tool, follow scan tool manufacturer's instructions.

NOTE: Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 41-194°F (5-90°C). ECM will abort adaptation if; throttle valve cannot be closed completely (e.g. dirty throttle body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation. If TVCM does not adapt to ECM, wiring to TVCM or TVCM may be at fault. Check for DTCs. See DIAGNOSTIC TROUBLE CODE IDENTIFICATION . Repair as necessary.

Adapting Throttle Valve Control Module (Generic Scan Tool)

If possible it is best to warm-up vehicle by test driving. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Follow scan tool manufacturer's instructions and adapt throttle valve control module to ECM.

Adapting Throttle Valve Control Module (Scan Tool VAG 1551/1552 Or VAS 5051/5052)

1. If possible it is best to warm-up vehicle by test driving. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Using scan tool, retrieve DTCs. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If DTCs are stored. Repair as necessary. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . If no DTCs are stored, press right arrow key. Using scan tool, clear DTC memory. See **CLEARING DIAGNOSTIC TROUBLE CODES** . After clearing codes, press right arrow key. Go to next step. connector
2. Adapt Throttle Valve Control Module (J338). Press keys "0" and "1" for address word "Engine Electronics", and enter by pressing "Q" key. Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press keys "0", "6" and "0" for "Display Group 60 Basic Setting", and enter by pressing "Q" key. After no longer than 30 seconds, ADP. OK should appear in specification window of display field 4. If APD. OK appears TVCM has adapted successfully. Wait a minimum of 30 seconds before ending "Display Group 60 Basic Setting".
3. To end "Display Group 60 Basic Setting" press right arrow key. Press keys "0" and "6" for function "End Output" and enter by pressing "Q" key. To store values, turn ignition off for at least 25 seconds (control module after-run). If APD. ERROR appears TVCM has not adapted successfully. Check for DTCs. See **DIAGNOSTIC TROUBLE CODE IDENTIFICATION** . Repair as necessary.

A/T BASIC SETTING

NOTE: There is no A/T basic setting for Passat, (it uses a TCM that does not require basic setting procedure).

NOTE: A/T basic setting must be initiated when Engine, ECM (J220), A/T Control Module (J217), Throttle Valve Control Module (J338), or Accelerator Pedal Position (APP) sensor 1 (G79) and APP sensor 2 (G185) are replaced. APP sensor 1 (G79) and APP sensor 2 (G185) are one unit, they are not adjustable and can not be replaced separately). It is also necessary to initiate A/T basic setting if idle speed has been adjusted.

A/T Basic Setting (Generic Scan Tool)

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Follow scan tool manufacturer's instructions to initiate basic setting for A/T.

A/T Basic Setting (Scan Tool VAG 1551/1552 Or VAS 5051/5052)

1. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off.
2. Using scan tool check for DTCs. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . If any DTCs are present, repair as necessary and clear codes, see **CLEARING DIAGNOSTIC TROUBLE CODES** . Initiate basic setting for A/T. Press keys "0" and "2" for address word "Transmission Electronics", advance scan tool by press right arrow key until "Select Function XX" appears. Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press "0" key 3 times, for "Display Group "0" Basic Setting", and enter by pressing "Q" key. Depress accelerator pedal as far as kickdown and hold in this position for 3 seconds. Press right arrow key.

ADAPTING KICKDOWN FUNCTION

NOTE: Kickdown function adaptation must be performed when ECM or Accelerator Pedal Position (APP) sensor 1 (G79) and APP sensor 2 (G185) are replaced, (APP sensor 1 (G79) and APP sensor 2 (G185) are one unit, they are not adjustable and can not be replaced separately).

1. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off.
2. Press keys "0" and "1" for address word "Engine Electronics". Press keys "0" and "4" for "Basic Setting", and enter by pressing "Q" key. Press keys "0", "6" and "3" for display group 63 and enter by pressing "Q" key. Observe display zones 3 and 4, "Operate kick down" should display. Press accelerator pedal beyond kick-down pressure point to floor. Hold accelerator pedal to floor for at least 2 seconds. Observe display zones 3 and 4, "Kick Down ADP. runs" should display, then "Kick Down ADP. OK" should appears in display zones 3 and 4. Press right arrow key. Press keys "0" and "6" for function "End output" and enter by pressing "Q" key.
3. If "Kick Down ADP. OK" appeared in display zones 3 and 4, adaptation was successful. If "Kick Down ERROR" appeared in display zones 3 and 4, adaptation was unsuccessful. Check accelerator position sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . Repair as necessary.

ACTIVATING/DEACTIVATING CRUISE CONTROL

Activating/Deactivating Cruise Control (Generic Scan Tool)

- Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Follow scan tool manufacturer's instructions to Activating/Deactivating Cruise Control.

Activating Cruise Control (Scan Tool VAG 1551/1552 Or VAS 5051/5052)

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Press keys "1", "1", "4", "6" and "3" for Code Number 11463 and enter by pressing "Q" key. Turn ignition off. Activation is complete.

Deactivating Cruise Control (Scan Tool VAG 1551/1552 Or VAS 5051/5052)

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on, engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Press keys "1", "6", "1", "6" and "7" for Code Number 16167 and enter by pressing "Q" key. Turn ignition off. Deactivation is complete.

IMMOBILIZER

Immobilizer Adaptation To ECM (J220) (Generic Scan Tool)

NOTE: **This article is for adapting new key(s) and readapting currently valid keys only (it is necessary to readapt currently valid keys when adapting new key). For immobilizer system diagnostics. See appropriate DOOR LOCKS & ANTI-THEFT SYSTEMS, under ACCESSORIES & EQUIPMENT.**

NOTE: **Warning Light for Anti-Theft Immobilizer (K117) is located in speedometer gauge. Properly functioning immobilizer system is indicated by warning light for Anti-Theft Immobilizer (K117) lighting up and going out after approximately 3 seconds when ignition is turned on. Malfunction in immobilizer system is indicated, when ignition is turned on and warning light flashes or lights up continuously. For immobilizer system diagnostics. See appropriate DOOR LOCKS & ANTI-THEFT SYSTEMS, under ACCESSORIES & EQUIPMENT.**

NOTE: **Manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052. Starting with Model Year 2002, Golf and Jetta are equipped with Immobilizer Generation III (Starting 6/2001 for Beetle). Ignition keys for Immobilizer III may be marked "W3". For more reliable differentiation, always use the function "check control module version". Scan Tool VAS 5051 or 5052 must be used for Immobilizer Generation III diagnoses and coding. A correct Importer/Dealer number must reside in VAS 5051 or VAS 5052 in order to request a PIN number and to adapt Immobilizer Generation III.**

NOTE: **Three attempts to enter secret code number is initially possible. Next three attempts to enter secret code number is only possible after a minimum of 10 minutes (with ignition remaining on during this time and OBD program is exited by function 06 "End Output"). Waiting period between each three attempts doubles each time up to a maximum of 255 minutes.**

Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Follow scan tool manufacturer's instructions for Immobilizer Adaptation.

Immobilizer Adaptation To ECM (J220) (Scan Tool VAG 1551/1552 Or VAS 5051/5052)

1. Connect scan tool to DLC. DLC is located at left side of steering column. See **Fig. 1** . Turn ignition on using a currently valid key, engine off. Press keys "0" and "1" for address word "Engine Electronics". Press "1" key 2 times for "Login Procedure" function 11 and enter by pressing "Q" key. Scratch off protective coating on new key and read secret code number of new key. Key in secret code number preceded by a "0"into scan tool, e.g. "0", "1", "9", "1" and "5" if secret code number is 1915 and enter by pressing "Q" key. If "Rapid Data Transfer Select Function XX HELP" displays on scan tool, secret code number has been accepted, leave key in on position and go to next step. If "Test Sends Address Word 17" displays on scan tool. Repeat adaptation procedure and re-enter secret code number.
2. Press keys "1" and "0" for "Adaptation" function 10 and enter by pressing "Q" key. Press keys "2" and "1" for "Channel 21" and enter by pressing "Q" key. If "Channel 21 Adapting 2 <-1 3->" displays on scan tool, press right arrow key. Go to next step. If "Function Is Unknown Or Can Not Be Carried Out At The Moment" displays on scan tool. Repeat adaptation procedure and re-enter secret code number.

3.

NOTE: If warning light flashes continuously, key adapting procedure is faulty and must be performed again. Only 30 seconds of ignition on time is given to adapt all keys, 30 seconds start from the time immobilizer warning light goes out when first key is adapted. Warning light flashes quickly and a DTC is stored if 30 seconds are exceeded when adapting all ignition keys. During time period that ignition is turned off, time does not register.

If "Channel 21 Adapting 2 Enter Adaptation Value XXXXX" displays on scan tool. Press "0" key 4 times and than enter total number of keys to be adapted, including key in ignition (e.g. 1 new key, 1 key in ignition and 3 additional keys would be "00005", a total of 8 keys is maximum) and enter by pressing "Q" key. "Channel 21 Adapting 5 <-1 3->" should display (e.g. if 5 keys are to be adapted) and enter by pressing "Q" key. "Channel 21 Adapting 5 Store Changed Value ?" should display (e.g. if 5 keys are to be adapted). Press "Q" key to enter. "Channel 21 Adapting 5 Store Changed Value Is Stored" should display (e.g. if 5 keys are to be adapted). In VDO instrument clusters, warning light for immobilizer should go out. Key in ignition is now adapted. Press right arrow key. Switch ignition off and remove key. Go to next step.

4. Insert next key to be adapted in ignition lock and turn ignition on. Warning light for anti-theft immobilizer lights up for approximately 2 seconds and then goes out. When warning light for anti-theft immobilizer goes out, turn ignition off and remove key. Repeat this procedure until all keys are adapted. Warning light for anti-theft immobilizer flashes briefly after last key is adapted. Press keys "0" and "2" for "Check DTC Memory" function "2". If no DTC(s) are stored adapting of all keys was successful.

NOTE: Identity of ECM is read into the immobilizer control module next time ignition is switched on.

OXYGEN SENSOR ADAPTATION

Checking Oxygen Sensor Adaptation is part of Readiness Code procedures. Oxygen sensors are self adapting.

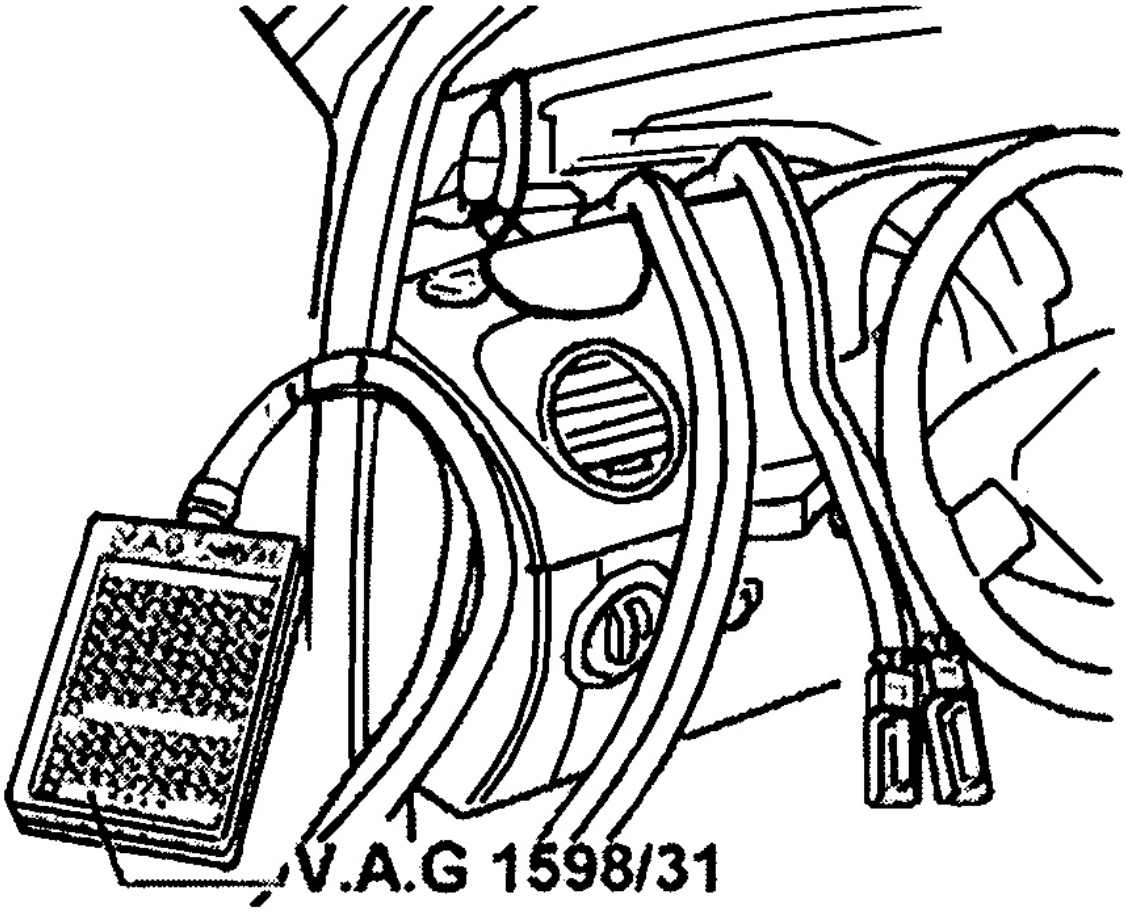
SUMMARY

If no Diagnostic Trouble Codes (DTCs) are present and a no-start condition exists, proceed to appropriate BASIC DIAGNOSTIC PROCEDURES article. If no DTCs are present and a driveability condition exists, proceed to appropriate TROUBLE SHOOTING - NO CODES article for diagnosis by symptom (i.e., ROUGH IDLE, ENGINE STALLS, etc.).

CONNECTING VAG TEST BOX

BEETLE

Turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Connect test equipment. See **Fig. 9** .



G00064788

Fig. 9: Connecting VAG Test Box 1598/31 (Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

GTI & JETTA

Turn ignition off. Remove wiper arms and cowl panel. Connect test equipment. See **Fig. 10** .

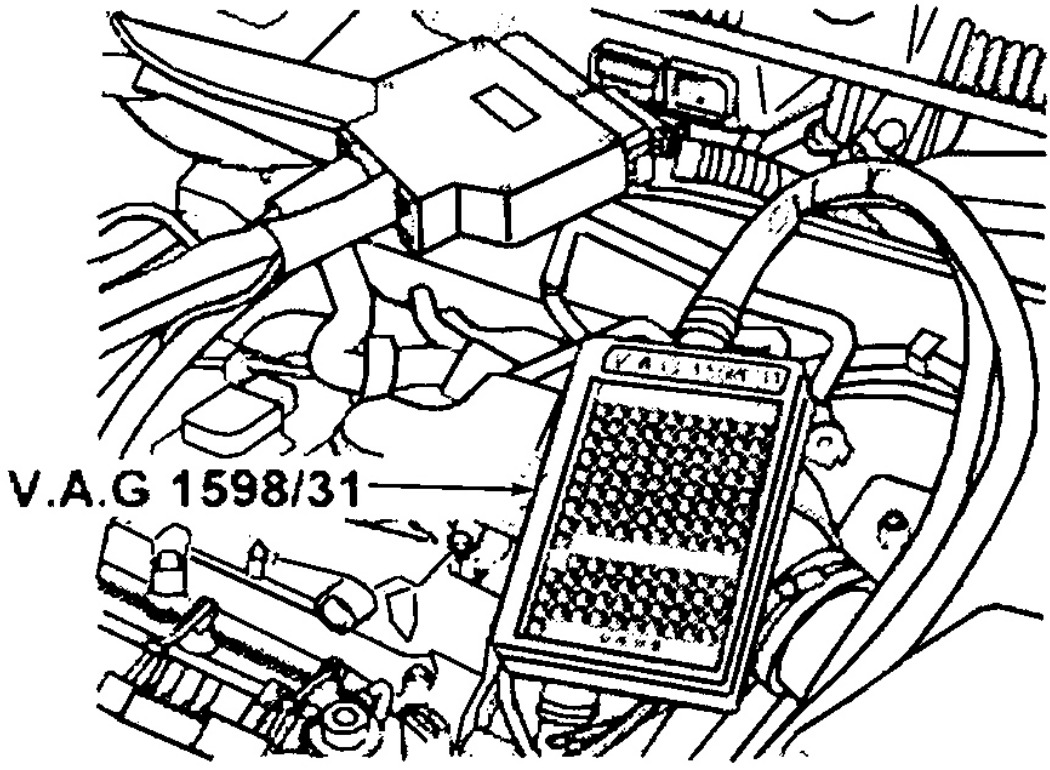
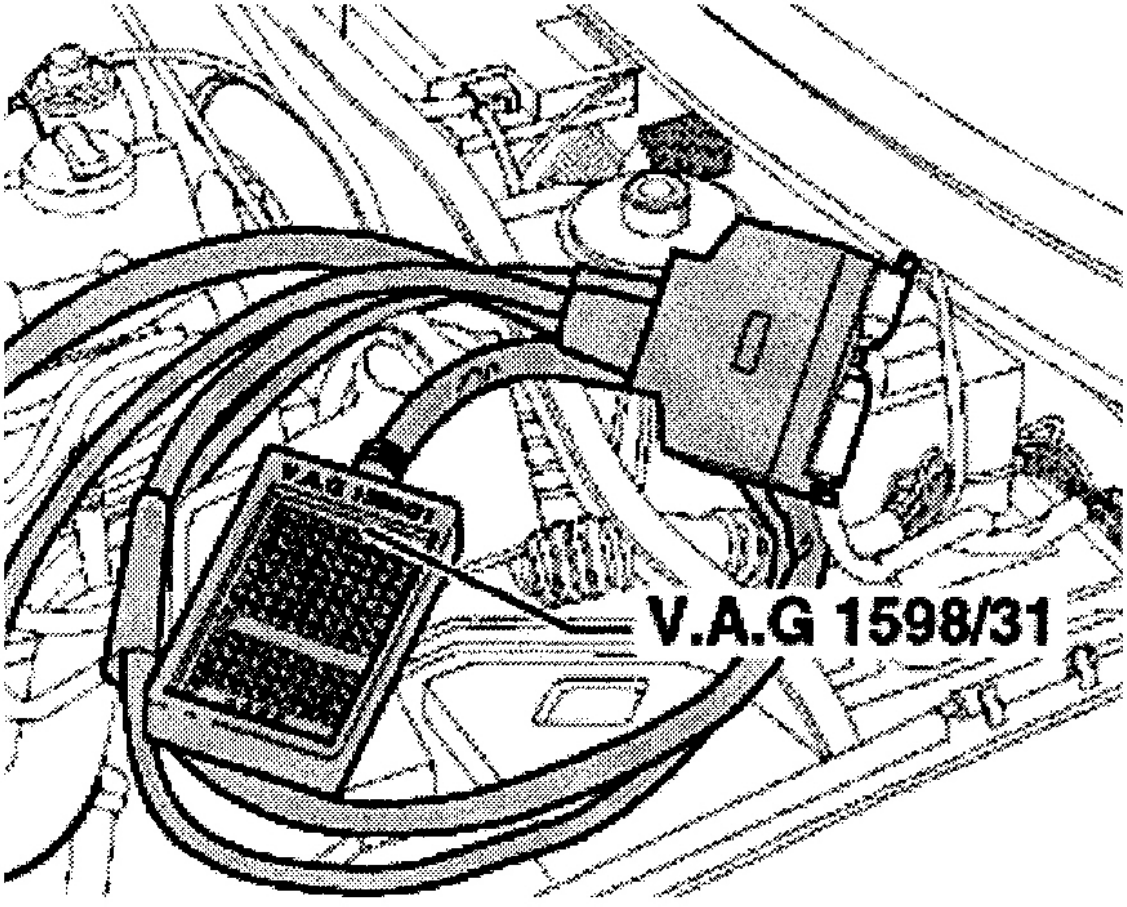


Fig. 10: Connecting VAG Test Box 1598/31 (GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

PASSAT

Turn ignition off. Connect test equipment. See **Fig. 11** .



G00064790

Fig. 11: Connecting VAG Test Box 1598/31 (Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DIAGNOSTIC TROUBLE CODE IDENTIFICATION

NOTE: **Read and record DTCs before starting diagnostic work, (some testing procedures will set DTCs).**

NOTE: **Manufacturer recommends use of Scan Tool VAG 1551/1552 or VAS 5051/5052. Generic scan tool may not be able to perform all test functions. If engine does not start, (this test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052). Connect scan tool. Operate starter for approximately 6 seconds, do not switch ignition off. Turn on scan tool printer. Operate scan tool, according to scan tool display information. Check for DTCs.**

Diagnostic information is identified by model and engine code. See **ENGINE CODES (2000-03)** table. Use **DTC IDENTIFICATION** table to identify possible cause. If ECM is experiencing a communication failure (no communication at all), see SYSTEM & COMPONENT TESTING article and perform appropriate tests.

DTC IDENTIFICATION

DTC SAE	DTC VAG	Possible Cause
No Fault Code	No Fault Code	(1)
P0010	**16394**	Intake Camshaft Adjustment - Malfunction
P0011	**16395**	Intake Camshaft Retard Adjustment - Specification Not Reached
P0012	**16396**	Intake Camshaft Advance Adjustment - Specification Not Reached
P0030	**16414**	HO2 Sensor (G39) Upstream TWC - Heating Open Circuit
P0031	**16415**	HO2 Sensor (G39) Upstream TWC - Heating Short To Ground
P0032	**16416**	HO2 Sensor (G39) Upstream TWC - Heating Short To B+
P0036	**16420**	HO2 Sensor (G130) Downstream TWC - Heating Open Circuit
P0037	**16421**	HO2 Sensor (G130) Downstream TWC - Heating Short To Ground
P0038	**16422**	HO2 Sensor (G130) Downstream TWC - Heating Short To B+
P0101	**16485**	MAF Sensor (G70) - Implausible Signal
P0102	**16486**	MAF Sensor (G70) - Voltage Signal Too Low
P0103	**16487**	MAF Sensor (G70) - Voltage Signal Too High
P0106	**16490**	Charge Air Pressure Sensor (G31) Barometric Pressure Sensor (F96) - Implausible Signal
P0107	**16491**	Charge Air Pressure Sensor (G31) Barometric Pressure Sensor (F96) - Signal Too Small
P0108	**16492**	Charge Air Pressure Sensor (G31) Barometric Pressure Sensor (F96) - Signal Too Large
P0112	**16496**	IAT Sensor (G42) - Signal Too Low
P0113	**16497**	IAT Sensor (G42) - Signal Too High
P0116	**16500**	ECT Sensor (G62) - Implausible Signal
P0117	**16501**	ECT Sensor (G62) - Signal Too Low
P0118	**16502**	ECT Sensor (G62) - Signal Too High
P0121	**16505**	Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal
P0122	**16506**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
P0123	**16507**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High
P0130	**16514**	HO2 Sensor (G39) Upstream TWC - Heating Circuit Malfunction
P0131	**16515**	HO2 Sensor (G39) Upstream TWC - Voltage Too Low
P0132	**16516**	HO2 Sensor (G39) Upstream TWC - Voltage Too High
P0133	**16517**	HO2 Sensor (G39) Upstream TWC - Signal Too Slow (Engine Codes AWV & AWM)
P0133	**16517**	HO2 Sensor (G39) Upstream TWC - Signal Too Slow (Engine Code AWP)
P0134	**16518**	HO2 Sensor (G39) Upstream TWC - No Activity (Engine Codes AWV & AWM)

P0134	**16518**	HO2 Sensor (G39) Upstream TWC - No Activity (Engine Code AWP)
P0135	**16519**	HO2 Sensor (G39) Upstream TWC - Heating Element Circuit Malfunction
P0136	**16520**	HO2 Sensor (G130) Downstream TWC - Circuit Malfunction
P0137	**16521**	HO2 Sensor (G130) Downstream TWC - Voltage Too Low
P0138	**16522**	HO2 Sensor (G130) Downstream TWC - Voltage Too High
P0139	**16523**	HO2 Sensor (G130) Downstream TWC - Signal Too Slow (Engine Codes AWV & AWM)
P0139	**16523**	HO2 Sensor (G130) Downstream TWC - Signal Too Slow (Engine Code APW)
P0140	**16524**	HO2 Sensor (G130) Downstream TWC - No Activity
P0141	**16525**	HO2 Sensor (G130) Heating Downstream TWC - Heating Element Circuit Malfunction
P0170	**16554**	Fuel Trim - System Malfunction
P0171	**16555**	Fuel Trim - Too Lean
P0172	**16556**	Fuel Trim - Too Rich
P0197	**16581**	Oil Level Sensor (G266) - Signal Too Low
P0198	**16582**	Oil Level Sensor (G266) - Signal Too High
P0201	**16585**	Injector Cylinder 1 (N30) - Electrical Circuit Malfunction
P0202	**16586**	Injector Cylinder 2 (N31) - Electrical Circuit Malfunction
P0203	**16587**	Injector Cylinder 3 (N32) - Electrical Circuit Malfunction
P0204	**16588**	Injector Cylinder 4 (N33) - Electrical Circuit Malfunction
P0219	**16603**	Maximum Engine RPM Exceeded
P0221	**16605**	Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal
P0222	**16606**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
P0223	**16607**	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High
P0226	**16610**	Accelerator Pedal Position Sensor 1 (G79) Accelerator Pedal Position Sensor 2 (G185) - Implausible Signal
P0230	**16614**	Fuel Pump Relay (J17) - Electrical Circuit Malfunction
P0234	**16618**	Charge Pressure Regulation - Control Limit Exceeded
P0235	**16619**	Charge Pressure Regulation - Control Limit Not Achieved
P0236	**16620**	Charge Air Pressure Sensor (G31) - Implausible Signal
P0237	**16621**	Charge Air Pressure Sensor (G31) - Signal Too Low
P0238	**16622**	Charge Air Pressure Sensor (G31) - Signal Too High
P0243	**16627**	Wastegate By-Pass Regulator Valve (N75) - Open/Short To Ground
P0245	**16629**	Wastegate By-Pass Regulator Valve (N75) - Short To Ground
P0246	**16630**	Wastegate By-Pass Regulator Valve (N75) - Short To B+
P0261	**16645**	Injector Cylinder 1 (N30) - Short To Ground

P0262	**16646**	Injector Cylinder 1 (N30) - Short To B+
P0264	**16648**	Injector Cylinder 2 (N31) - Short To Ground
P0265	**16649**	Injector Cylinder 2 (N31) - Short To B+
P0267	**16651**	Injector Cylinder 3 (N32) - Short To Ground
P0268	**16652**	Injector Cylinder 3 (N32) - Short To B+
P0270	**16654**	Injector Cylinder 4 (N33) - Short To Ground
P0271	**16655**	Injector Cylinder 4 (N33) - Short To B+
P0300	**16684**	Misfire Recognized
P0301	**16685**	Cylinder 1 - Misfire
P0302	**16686**	Cylinder 2 - Misfire
P0303	**16687**	Cylinder 3 - Misfire
P0304	**16688**	Cylinder 4 - Misfire
P0318	**16702**	Poor Road Information From ABS Control Module (J104) - Electrical Circuit Malfunction
P0321	**16705**	Engine Speed Sensor (RPM) (G28) - Implausible Signal
P0322	**16706**	Engine Speed Sensor (RPM) G28) - No Signal
P0324	**16708**	Knock Control Malfunction
P0327	**16711**	Knock Sensor 1 (G61) - Signal Too Low (Except Passat)
P0327	**16711**	Knock Sensor 1 (G61) - Signal Too Low (Passat Only)
P0328	**16712**	Knock Sensor 1 (G61) - Signal Too High (Except Passat)
P0328	**16712**	Knock Sensor 1 (G61) - Signal Too High (Passat Only)
P0332	**16716**	Knock Sensor 2 (G66) - Signal Too Low (Except Passat)
P0332	**16716**	Knock Sensor 2 (G66) - Signal Too Low (Passat Only)
P0333	**16717**	Knock Sensor 2 (G66) - Signal Too High (Except Passat)
P0333	**16717**	Knock Sensor 2 (G66) - Signal Too High (Passat Only)
P0340	**16724**	Camshaft Position Sensor (G40) - Malfunction
P0341	**16725**	Camshaft Position Sensor (G40) - Implausible Signal
P0342	**16726**	Camshaft Position Sensor (G40) - Signal Too Low
P0343	**16727**	Camshaft Position Sensor (G40) - Signal Too High
P0351	**16735**	Ignition Control Cylinder 1 - Malfunction
P0352	**16736**	Ignition Control Cylinder 2 - Malfunction
P0353	**16737**	Ignition Control Cylinder 3 - Malfunction
P0354	**16738**	Ignition Control Cylinder 4 - Malfunction
P0411	**16795**	Secondary Air System - Incorrect Flow Detected
P0412	**16796**	Secondary Air Injection Valve (N112) - Electrical Circuit Malfunction
P0413	**16797**	Secondary Air Injection Valve (N112) - Open Circuit
P0414	**16798**	Secondary Air Injection Valve (N112) - Short Circuit
P0418	**16802**	Secondary Air Injection Pump Relay (J299) - Malfunction

P0420	**16804**	Catalyst System - Efficiency Below Threshold
P0422	**16806**	Catalyst System - Efficiency Below Threshold
P0440	**16824**	EVAP, Fuel Tank Ventilation System - Malfunction
P0441	**16825**	EVAP, Fuel Tank Ventilation System - Flow Rate Malfunction
P0442	**16826**	EVAP Emission Control System - Small Leak Detected
P0443	**16827**	EVAP Fuel Tank Ventilation System - Electrical Circuit Malfunction
P0444	**16828**	EVAP Canister Purge Valve - Open Circuit
P0445	**16829**	EVAP Canister Purge Valve - Short Circuit
P0455	**16839**	EVAP Emission Control System - Very Large Leak Detected
P0456	**16840**	EVAP Emission Control System - Very Small Leak Detected
P0501	**16885**	Vehicle Speed Signal - Implausible Signal
P0506	**16890**	Idle Speed Control - RPM Too Low
P0507	**16891**	Idle Speed Control - RPM Too High
P0513	**16897**	Immobilizer - Incorrect Code
P0532	**16916**	A/C Pressure Signal - Too Small
P0533	**16917**	A/C Pressure Signal - Too Large
P0560	**16944**	ECM (J220) Voltage Supply - Implausible Signal
P0562	**16946**	ECM (J220) Voltage Supply - Too Low
P0563	**16947**	ECM (J220) Voltage Supply - Too High
P0568	**16952**	Cruise Control System Switch (E45) - Implausible Signal
P0571	**16955**	Brake Light Switch (F) - Implausible Signal
P0600	**16984**	Data Bus Drive - Missing Signal
P0601	**16985**	ECM (J220) - Malfunction
P0602	**16986**	ECM (J220) - Programming Malfunction
P0604	**16988**	ECM (J220) - Malfunction
P0605	**16989**	ECM (J220) - Malfunction
P0606	**16990**	ECM (J220) - Malfunction
P0638	**17022**	Throttle Valve Control Module (J338) - Implausible Signal
P0642	**17026**	Knock Sensor - ECM Malfunction
P0650	**17034**	MIL (K83) - OBD Electrical Circuit Malfunction
P0685	**17069**	Power Supply Relay (J271) - Open Circuit
P0686	**17070**	Power Supply Relay (J271) - Short Circuit To Ground
P0687	**17071**	Power Supply Relay (J271) - Short Circuit To B+
P0688	**17072**	Power Supply Relay (J271) - Open Load Circuit
P0704	**17088**	Clutch Vacuum Vent Switch (F36) - Implausible Signal
P1102	**17510**	HO2 Sensor (G39) Upstream TWC - Heating Element Circuit Short To B+
P1103	**17511**	HO2 Sensor (G39) Upstream TWC - Heating Element Output Too

		Low
P1105	**17513**	HO2 Sensor (G130) Downstream TWC - Heating Circuit Short To B+
P1111	**17519**	HO2 Sensor (G39) Control, Upstream TWC - System Too Lean
P1112	**17520**	HO2 Sensor (G39) Control, Upstream TWC - System Too Rich
P1113	**17521**	HO2 Sensor (G39) Upstream TWC - Internal Resistance Too High
P1114	**17522**	HO2 Sensor (G130) Downstream TWC - Internal Resistance Too High
P1115	**17523**	HO2 Sensor (G39) Upstream TWC - Heating Circuit Short To Ground
P1116	**17524**	HO2 Sensor (G39) Upstream TWC - Heating Circuit Open
P1117	**17525**	HO2 Sensor (G130) Downstream TWC - Heating Circuit Short To Ground
P1118	**17526**	HO2 Sensor (G130) Downstream TWC - Heating Circuit Open
P1127	**17535**	HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Rich
P1128	**17536**	HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Lean
P1136	**17544**	HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Lean At Idle
P1137	**17545**	HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Rich At Idle
P1141	**17549**	Load Detection - Implausible Value
P1142	**17550**	Load Detection - Lower Limit Not Reached
P1143	**17551**	Load Detection - Upper Limit Exceeded
P1149	**17557**	HO2 Sensor (G39) Upstream TWC - Implausible Signal
P1171 (2)	**17579** (2)	Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal
P1172 (2)	**17580** (2)	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
P1173 (2)	**17581** (2)	Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High
P1176	**17584**	HO2 Sensor (G39) Correction Upstream TWC, HO2 Sensor (G130) Downstream TWC - Control Limit Reached (Engine Codes AWV & AWM)
P1176	**17584**	HO2 Sensor (G39) Correction Upstream TWC, HO2 Sensor (G130) Downstream TWC - Control Limit Reached (Engine Code AWP)
P1196	**17604**	HO2 Sensor (G39) Upstream TWC - Electrical Malfunction
P1198	**17606**	HO2 Sensor (G130) Downstream TWC - Heating Circuit Malfunction
P1200	**17608**	Recirculating Valve For Turbocharger (N249) - Mechanical Malfunction
P1201	**17609**	Injector Cylinder 1 (N30) - Electrical Malfunction

P1202	**17610**	Injector Cylinder 2 (N31) - Electrical Malfunction
P1203	**17611**	Injector Cylinder 3 (N32) - Electrical Malfunction
P1204	**17612**	Injector Cylinder 4 (N33) - Electrical Malfunction
P1213	**17621**	Injector Cylinder 1 (N30) - Short To B+
P1214	**17622**	Injector Cylinder 2 (N31) - Short To B+
P1215	**17623**	Injector Cylinder 3 (N32) - Short To B+
P1216	**17624**	Injector Cylinder 4 (N33) - Short To B+
P1225	**17633**	Injector Cylinder 1 (N30) - Short To Ground
P1226	**17634**	Injector Cylinder 2 (N31) - Short To Ground
P1227	**17635**	Injector Cylinder 3 (N32) - Short To Ground
P1228	**17636**	Injector Cylinder 4 (N33) - Short To Ground
P1237	**17645**	Injector Cylinder 1 (N30) - Open Circuit
P1238	**17646**	Injector Cylinder 2 (N31) - Open Circuit
P1239	**17647**	Injector Cylinder 3 (N32) - Open Circuit
P1240	**17648**	Injector Cylinder 4 (N33) - Open Circuit
P1250	**17658**	Fuel Level Too Low
P1287	**17695**	Recirculating Valve For Turbocharger (N249) - Open Circuit
P1288	**17696**	Recirculating Valve For Turbocharger (N249) - Short To B+
P1289	**17697**	Recirculating Valve For Turbocharger (N249) - Short To Ground
P1295	**17703**	Wastegate By-Pass Regulator Valve (N75) - Malfunction
P1296	**17704**	Malfunction In Cooling System
P1297	**17705**	Turbocharger To Throttle Valve Connection - Pressure Loss
P1325	**17733**	Knock Control Cylinder 1 - Limit Reached (Except Passat)
P1325	**17733**	Knock Control Cylinder 1 - Limit Reached (Passat Only)
P1326	**17734**	Knock Control Cylinder 2 - Limit Reached (Except Passat)
P1326	**17734**	Knock Control Cylinder 2 - Limit Reached (Passat Only)
P1327	**17735**	Knock Control Cylinder 3 - Limit Reached (Except Passat)
P1327	**17735**	Knock Control Cylinder 3 - Limit Reached (Passat Only)
P1328	**17736**	Knock Control Cylinder 4 - Limit Reached (Except Passat)
P1328	**17736**	Knock Control Cylinder 4 - Limit Reached (Passat Only)
P1335 (2)	**17743** (2)	Engine Torque Monitoring 2 - Control Limit Exceeded
P1336	**17744**	Engine Torque Monitoring - Control Limit Exceeded
P1337	**17745**	Camshaft Position Sensor (G40) - Short To Ground
P1338	**17746**	Camshaft Position Sensor (G40) - Open Circuit/Short To B+
P1340	**17748**	Camshaft Position Sensor (G40), Engine Speed Sensor (G28) - Incorrect Allocation
P1355	**17763**	Ignition Activation Cylinder 1 - Open Circuit
P1356	**17764**	Ignition Activation Cylinder 1 - Short To B+
P1357	**17765**	Ignition Activation Cylinder 1 - Short To Ground

P1358	**17766**	Ignition Activation Cylinder 2 - Open Circuit
P1359	**17767**	Ignition Activation Cylinder 2 - Short To B+
P1360	**17768**	Ignition Activation Cylinder 2 - Short To Ground
P1361	**17769**	Ignition Activation Cylinder 3 - Open Circuit
P1362	**17770**	Ignition Activation Cylinder 3 - Short To B+
P1363	**17771**	Ignition Activation Cylinder 3 - Short To Ground
P1364	**17772**	Ignition Activation Cylinder 4 - Open Circuit
P1365	**17773**	Ignition Activation Cylinder 4 - Short To B+
P1366	**17774**	Ignition Activation Cylinder 4 - Short To Ground
P1386 (2)	**17794** (2)	ECM (J220) - Malfunction
P1387 (2)	**17795** (2)	ECM (J220) - Malfunction
P1388 (2)	**17796** (2)	ECM (J220) - Malfunction
P1409	**17817**	EVAP Canister Purge Valve (N80) - Electrical Circuit Malfunction
P1410	**17818**	EVAP Canister Purge Valve (N80) - Short To B+
P1420	**17828**	Secondary Air Injection Valve (N112) - Electrical Circuit Malfunction
P1421	**17829**	Secondary Air Injection Valve (N112) - Short To Ground
P1422	**17830**	Secondary Air Injection Valve (N112) - Short To B+
P1424	**17832**	Secondary Air System - Leak Detected
P1425	**17833**	EVAP Canister Purge Valve (N80) - Short To Ground
P1426	**17834**	EVAP Canister Purge Valve (N80) - Open Circuit
P1427	**17835**	Brake Vacuum Pump (V192) Activation - Short To B+
P1428	**17836**	Brake Vacuum Pump (V192) Activation - Short To Ground
P1429	**17837**	Brake Vacuum Pump (V192) Activation - Open Circuit
P1430	**17838**	Brake Vacuum Pump (V192) Activation - Open Circuit/Short To B+
P1431	**17839**	Brake Vacuum Pump (V192) Activation - Open Circuit/Short To Ground
P1432	**17840**	Secondary Air Injection Valve (N112) - Open Circuit
P1433	**17841**	Secondary Air Injection Pump Relay (J299) - Open Circuit
P1434	**17842**	Secondary Air Injection Pump Relay (J299) - Short To B+
P1435	**17843**	Secondary Air Injection Pump Relay (J299) - Short To Ground
P1436	**17844**	Secondary Air Injection Pump Relay (J299) - Electrical Circuit Malfunction
P1470	**17878**	EVAP Leak Detection Pump (V144) - Electrical Circuit Malfunction
P1471	**17879**	EVAP Leak Detection Pump (V144) - Short To B+
P1472	**17880**	EVAP Leak Detection Pump (V144) - Short To Ground
P1473	**17881**	EVAP Leak Detection Pump (V144) - Open Circuit

P1475	**17883**	EVAP Leak Detection Pump (V144) - No Signal
P1476	**17884**	EVAP Leak Detection Pump (V144) - Insufficient Vacuum
P1477	**17885**	EVAP Leak Detection Pump (V144) - Malfunction
P1478	**17886**	EVAP Leak Detection Pump (V144) - Blocked Tube/Hose
P1479	**17887**	Brake Vacuum System - Mechanical Malfunction
P1500	**17908**	Fuel Pump Relay (J17) - Circuit Malfunction
P1501	**17909**	Fuel Pump Relay (J17) - Short To Ground
P1502	**17910**	Fuel Pump Relay (J17) - Short To B+
P1517	**17925**	Power Supply Relay (J271) - Electrical Circuit Malfunction
P1519	**17927**	Camshaft Position Adjustment - Malfunction
P1523	**17931**	Crash Signal From Airbag Control Module (J234) - Implausible Signal
P1529	**17937**	Camshaft Adjustment Valve (N205) - Short To B+
P1530	**17938**	Camshaft Adjustment Valve (N205) - Short To Ground
P1531	**17939**	Camshaft Adjustment Valve (N205) - Short To Open Circuit
P1539	**17947**	Clutch Vacuum Vent Switch (F36) - Implausible Signal
P1541	**17949**	Fuel Pump Relay (J17) - Open Circuit
P1542 (2)	**17950** (2)	Angle Sensor 1 (G187) For Throttle Valve Drive - Implausible Signal
P1543 (2)	**17951** (2)	Angle Sensor 1 (G187) For Throttle Valve Drive - Signal Too Low
P1544 (2)	**17952** (2)	Angle Sensor 1 (G187) For Throttle Valve Drive - Signal Too High
P1545 (2)	**17953** (2)	Throttle Valve Control Malfunction
P1546	**17954**	Wastegate By-Pass Regulator Valve - Short To B+
P1547	**17955**	Wastegate By-Pass Regulator Valve - Short To Ground
P1548	**17956**	Wastegate By-Pass Regulator Valve - Open Circuit
P1550	**17958**	Charge Pressure - Control Deviation
P1555	**17963**	Maximum Charge Pressure - Exceeded
P1556	**17964**	Charge Pressure - Control Limit Not Achieved
P1557	**17965**	Charge Pressure - Control Limit Exceeded
P1558 (2)	**17966** (2)	Throttle Valve Drive (186) - Circuit Malfunction
P1559 (2)	**17967** (2)	Throttle Valve Control Module (J338) - Malfunction In Basic Setting
P1560	**17968**	Maximum Engine RPM Exceeded
P1564 (2)	**17972** (2)	Throttle Valve Control Module (J338) - Voltage Too Low During Basic Setting
P1565	**17973**	Throttle Valve Control Module (J338) - Lower Limit Not Reached
P1568 (2)	**17976** (2)	Throttle Valve Control Module (J338) - Mechanical Malfunction
P1569	**17977**	Cruise Control Switch (E45) - Implausible Signal
P1570	**17978**	ECM (J220) - Blocked

P1579 (2)	**17987** (2)	Throttle Valve Control Module - Adaption Not Started
P1602	**18010**	Voltage Supply Terminal 30 (B+) - Voltage Supply Too Low
P1603	**18011**	ECM (J220) - Malfunction
P1604 (2)	**18012** (2)	ECM (J220) - Malfunction
P1606	**18014**	Poor Road Information From ABS Control Module (J104) - Electrical Circuit Malfunction
P1609	**18017**	Crash Signal From Airbag Control Module
P1610 (2)	**18018** (2)	ECM (J220) - Malfunction
P1612	**18020**	ECM (J220) - Incorrectly Coded
P1615	**18023**	Oil Level Sensor (G266) - Implausible Signal
P1620	**18028**	ECT Sensor - Open Circuit/Short To B+
P1621	**18029**	ECT Sensor - Short To Ground
P1622	**18030**	ECT Sensor - Implausible Signal
P1624	**18032**	Request For Warning Lamp On Active
P1626	**18034**	Drivetrain Data Bus - No Signal From Transmission Control Module (J217)
P1628	**18036**	Drivetrain Data Bus - No Signal From Steering Angle Sensor (G85)
P1630 (2)	**18038** (2)	Accelerator Pedal Position Sensor 1 (G79) - Signal Too Low
P1631 (2)	**18039** (2)	Accelerator Pedal Position Sensor 1 (G79) - Signal Too High
P1633 (2)	**18041** (2)	Accelerator Pedal Position Sensor 2 (G185) - Signal Too Low
P1634 (2)	**18042** (2)	Accelerator Pedal Position Sensor 2 (G185) - Signal Too High
P1635	**18043**	Drivetrain Data Bus - No Signal From A/C Control Module (J255)
P1636	**18044**	Drivetrain Data Bus - No Signal From Airbag Control Module (J234)
P1639 (2)	**18047** (2)	Accelerator Pedal Position Sensor 1 (G79) Accelerator Pedal Position Sensor 2 (G185) - Implausible Signal
P1640	**18048**	ECM (J220) - Malfunction
P1648	**18056**	Drivetrain Data Bus Malfunction
P1649	**18057**	Drivetrain Data Bus - No Signal From ABS Control Module (J104)
P1650	**18058**	Drivetrain Data Bus - No Signal From Instrument Cluster Control Module (J285)
P1654	**18062**	Check Instrument Cluster DTC Memory
P1676 (2)	**18084** (2)	EPC Warning Light (K132) - Circuit Malfunction
P1677 (2)	**18085** (2)	EPC Warning Light (K132) - Short To B+
P1678 (2)	**18086** (2)	EPC Warning Light (K132) - Short To Ground
P1679 (2)	**18087** (2)	EPC Warning Light (K132) - Open Circuit
P1681	**18089**	ECM (J220) - Programing Not Finished
P1682	**18090**	Drivetrain Data Bus - Implausible Signal From ABS Control

		Module (J104)
P1683	**18091**	Drivetrain Data Bus - Implausible Signal From Airbag Control Module (J234)
P1687	**18095**	Drivetrain Data Bus - Implausible Signal From Climate Control Module (J255)
P1690	**18098**	MIL (K83) - Circuit Malfunction
P1691	**18099**	MIL (K83) - Open Circuit
P1692	**18100**	MIL (K83) - Short To Ground
P1693	**18101**	MIL (K83) - Short To B+
P1696	**18104**	Data Bus - Implausible Signal From Steering Column Electronics
P1699	**18107**	Data Bus - No Signal From Steering Column Electronics
P1853	**18261**	Drivetrain Data Bus - Implausible Signal From ABS Control Module (J104)
P1912	**18320**	Brake Servo Pressure Sensor (G294) - Short To B+/Open Circuit
P1913	**18321**	Brake Servo Pressure Sensor (G294) - Short To Ground
P2101	**18533**	Throttle Valve Control Module (J338) - Malfunction
P2122 (2)	**18554** (2)	Accelerator Pedal Position Sensor 1 (G79) - Signal Too Low
P2127 (2)	**18559** (2)	Accelerator Pedal Position Sensor 2 (G185) - Signal Too Low
P2128 (2)	**18560** (2)	Accelerator Pedal Position Sensor 2 (G185) - Signal Too High
P2138 (2)	**18570** (2)	Accelerator Pedal Position Sensor 1 (G79), Accelerator Pedal Position Sensor 2 (G185) - Implausible Signal

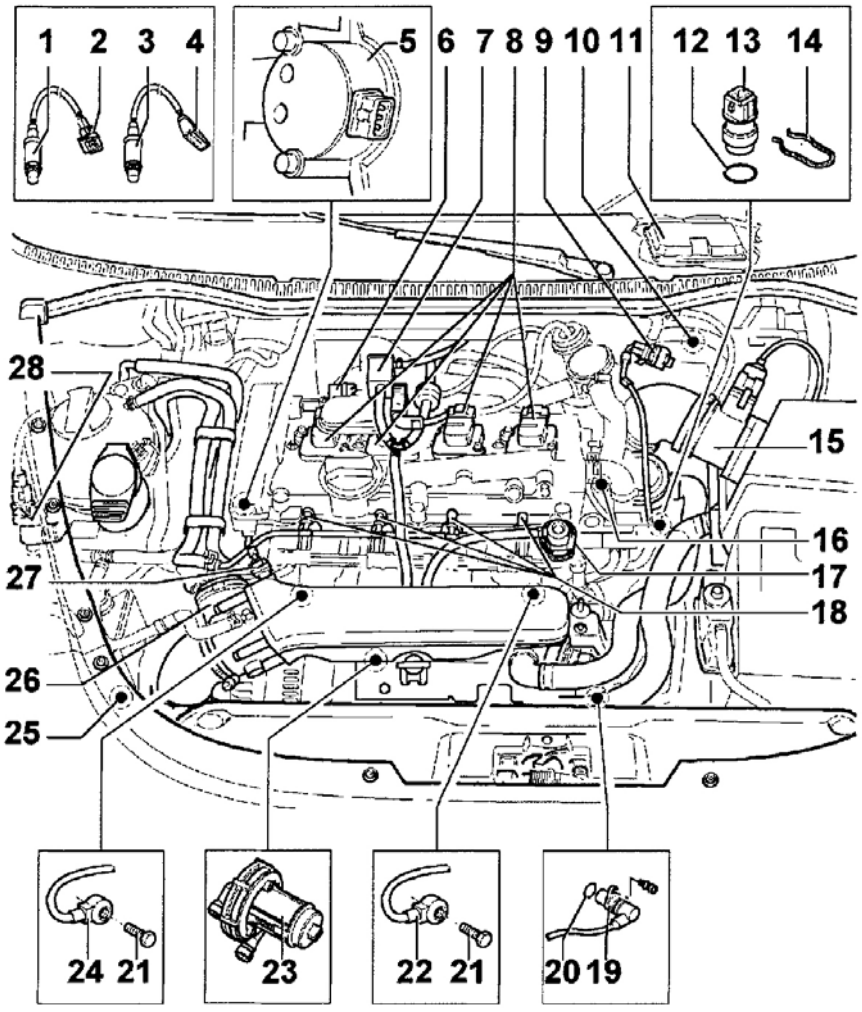
(1) No Fault Code, Displays "No DTC recognized" (On VAG and VAS Scan Tools).

(2) When this DTC is stored, Malfunction Indicator Light (MIL) and Electronic Power Control (EPC) light (in instrument cluster), are both turned on.

COMPONENT LOCATIONS

COMPONENT LOCATIONS

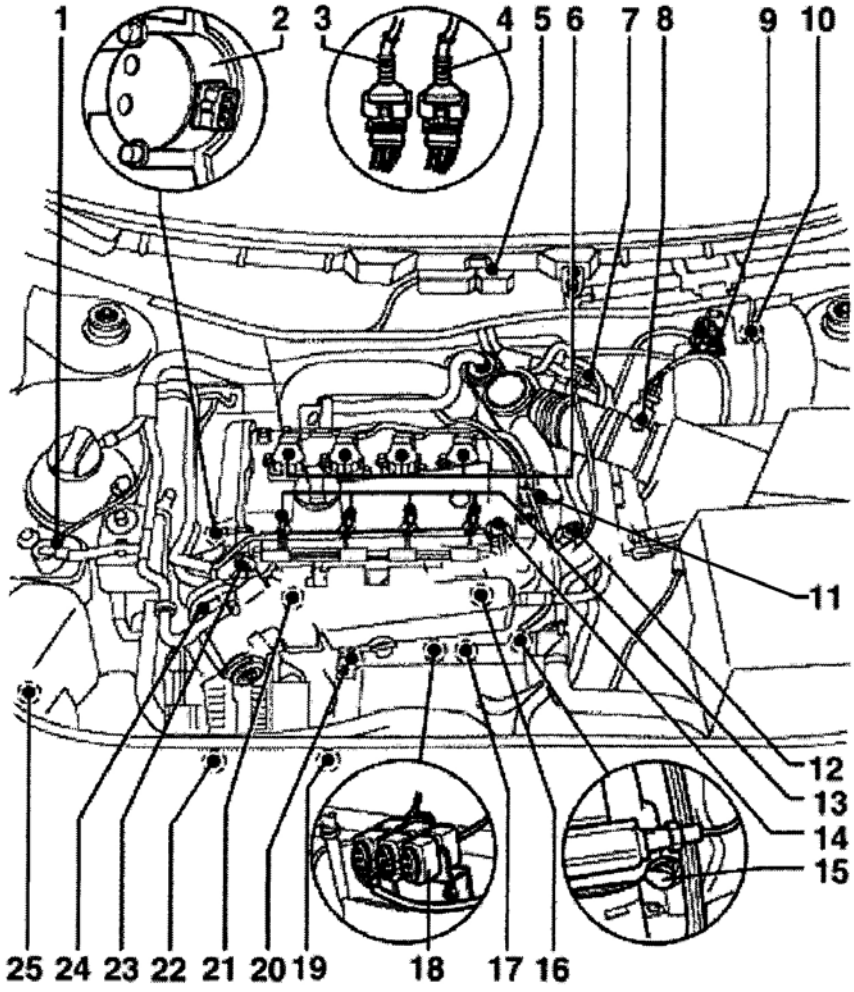
In diagnostic information, manufacturer identifies all system components with an alpha-numeric identification (e.g., J 220 is for ECM). See **MANUFACTURER'S COMPONENT ALPHA-NUMERIC IDENTIFICATION** table. Component location and pin test points are referenced in the individual DTC test procedures. Component locations are also referenced in component locating illustrations



1. HO2S 1 (G39)
2. Black 6-Pin Connector (HO2S No. 1)
3. HO2S 2 (G130)
4. Brown 4-Pin Connector (HO2S No. 2)
5. Camshaft Position Sensor (G163)
6. Secondary Air Injection Valve (N112)
7. Recirculating Valve For Turbocharger (N249)
8. Ignition Coils With Power Output Stage (N70, N127, N291 & N292)
9. Wastegate By-Pass Regulator Valve (N75)
10. Protective Housing (For Secondary Air Pump Relay)
11. Engine Control Module (J220)
12. "O" Ring
13. ECT Sensor (G62)
14. Retaining Clip
15. MAF Sensor (G70)
16. Valve For Camshaft Adjustment (N205) (Engine Code AWV)
17. Fuel Pressure Regulator
18. Injectors (N30-N33)
19. Engine Speed Sensor (G28)
20. "O" Ring
21. Knock Sensor Bolt
22. Knock Sensor 2 (G66)
23. Secondary Air Pump Motor (V101)
24. Knock Sensor 1 (G61)
25. Charge Air Pressure Sensor (G31)
26. Throttle Valve Control Module (J338)
27. IAT Sensor (G42)
28. EVAP Canister Purge Valve (N80)

G00064766

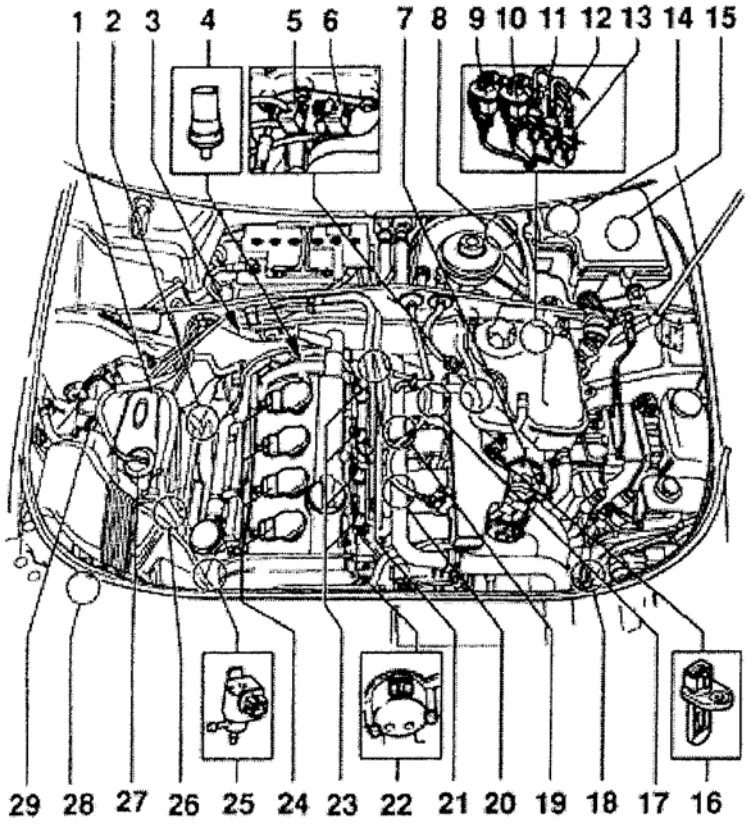
Fig. 12: Locating Engine Control System Components (Beetle - 1.8L Turbo)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. EVAP Canister Purge Valve (N80)
2. Camshaft Position Sensor (G163)
3. Black 4-Pin Connector (No. 1 HO2S) (Engine Code AWD)
   Black 6-Pin Connector (No. 1 HO2S) (Engine Codes AWW & AWP)
4. Brown 4-Pin Connector (No.2 HO2S) (Engine Code AWD)
   Black 4-Pin Connector (No. 2 HO2S) (Engine Codes AWW & AWP)
5. ECM (J220)
6. Ignition Coil With Power Output Stage (N70, N127, N291 & N292)
7. Wastegate By-Pass Regulator Valve (N75)
8. MAF Sensor (G70)
9. Secondary Air Pump Relay (J299)
10. Clutch Pedal Switch (F36), Brake Light Switch (F) & Brake Pedal Switch (F47) (All Components Located In Pedal Assembly)
11. Valve For Camshaft Adjustment (N205) (Engine Codes AWW & AWP)
12. ECT Sensor (G62)
13. Injectors (N30-N33)
14. Fuel Pressure Regulator
15. Engine Speed Sensor (G28)
16. Knock Sensor 2 (G66)
17. Recirculating Valve For Turbocharger (N249)
18. Brown 3-Pin Connector (Knock Sensor 1) (Engine Code AWD)
    Black 2-Pin Connector (Knock Sensor 1) (Engine Codes AWW & AWP)
    Black 3-Pin Connector (Knock Sensor 2) (Engine Code AWD)
    Black 2-Pin Connector (Knock Sensor 2) (Engine Codes AWW & AWP)
    Grey 3-Pin Connector (Engine Speed Sensor) (Engine Codes AWD, AWW & AWP)
19. Secondary Air Pump Motor (V101)
20. Secondary Air Injection Valve (N112)
21. Knock Sensor 1 (G61)
22. Power Steering Pressure Switch (F88)
23. IAT Sensor (G42)
24. Throttle Valve Control Module (J338)
25. Charge Air Pressure Sensor (G31)

G00064770

Fig. 13: Locating Engine Control System Components (Golf, GTI & Jetta - 1.8L Turbo)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



1. Air Cleaner
2. HO2S 1 (G39)
3. HO2S 2 (G130)
4. ECT Sensor
5. Recirculating Valve For Turbocharger (N249)
6. Secondary Air Injection Valve (N112)
7. Throttle Valve Control Module (J338)
8. Clutch Pedal Switch (F36), Brake Light Switch (F), Brake Pedal Switch (F47), Accelerator Position Sensor 1 (G79) & Accelerator Position Sensor 2 (G185) (All Components Located In Pedal Assembly)
9. Black 4-Pin Connector (HO2S No. 1) (Engine Code ATW) Brown 4-Pin Connector (HO2S No. 2) (Engine Codes AUG & AWM)
10. Brown 4-Pin Connector (HO2S No. 2) (Engine Code ATW) Black 6-Pin Connector (HO2S 1) (Engine Codes AUG & AWM)
11. Gray 3-Pin Connector (Engine Speed Sensor)
12. Green 3-Pin Connector (Knock Sensor 1)
13. Blue 3-Pin Connector (Knock Sensor 2)
14. Secondary Air Injection Relay (J299)
15. ECM (J220)
16. IAT Sensor (G42)
17. Engine Speed Sensor (G28)
18. Charge Air Pressure Sensor (G31)
19. Knock Sensor 2 (G66)
20. Knock Sensor 1 (G61)
21. Fuel Pressure Regulator
22. Camshaft Position Sensor (G163)
23. Fuel Injectors (N30-N33)
24. Ignition Coil With Power Output Stage (N70, N127, N291 & N292)
25. Wastegate By-Pass Regulator Valve (N75)
26. Ground Connection
27. MAF Sensor (G70)
28. Secondary Air Pump Motor (V101)
29. EVAP Canister Purge Valve (N80)

G00064769

Fig. 14: Locating Engine Control System Components (Passat - 1.8L Turbo)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

CONNECTOR IDENTIFICATION

Connector location and pin test points are referenced in the individual DTC test procedures. Connector locations are also referenced in component locating illustrations. See appropriate SYSTEM & COMPONENT TESTING article.

NOTE: Alpha-numeric identification in MANUFACTURER'S COMPONENT ALPHA-NUMERIC IDENTIFICATION table is only a partial list. These are the components

pertaining to engine performance.

MANUFACTURER'S COMPONENT ALPHA-NUMERIC IDENTIFICATION

Component	Alpha-Numeric Identification
ABS Control Module	J104
ABS Warning Light	K47
Accelerator Position Sensor 1	G79
Accelerator Position Sensor 2	G185
Air Bag Control Module	J234
Air Bag Warning Light	K75
AC Control Module	J255
Angle Sensor 1 For Throttle Valve Drive	G187
Angle Sensor 2 For Throttle Valve Drive	G188
Barometric Pressure Sensor (Inside ECM)	G96
Brake Booster Sensor	G294
Brake Light Switch	F
Brake Pedal Switch	F47
Brake Vacuum Pump Motor	V192
CAN Data Bus Interface (Gateway)	J533
Camshaft Position Sensor	G163
Charge Air Pressure Sensor	G31
Clutch Pedal Switch	F36
Comfort Systems Central Control Module	J393
ECM	J220
ECM Power Supply Relay	J271
ECT Sensor	G62
Engine Coolant Level Sensor	G32
Engine Speed (RPM) Sensor	G28
EPC Warning Light	K132
EVAP Canister Purge Valve	N80
EVAP Leak Detection Pump	V144
Fuel Pump	G6
Fuel Pump Relay	J17
HO2S Upstream TWC	G39
HO2S Downstream TWC	G130
IAT Sensor	G42
Ignition Coil With Power Output Stage	N70, N127, N129 & N292
Immobilizer Induction Coil	D2

Immobilizer Warning Light	K117
Injectors	N30-N33
Instrument Cluster Control Module (Also Used By Immobilizer)	J285
Knock Sensor 1	G61
Knock Sensor 2	G66
MAF Sensor	G70
Malfunction Indicator Light	K83
Oil Level Sensor	G266
Oil Pressure Switch	F1
Oil Pressure Warning Light	K3
Power Steering Switch	F88
Recirculating Valve For Turbocharger	N249
Secondary Air Injection Valve	N112
Secondary Air Pump Motor	V101
Secondary Air Pump Relay	J299
Steering Control Module	J453
Steering Sensor	G85
Throttle Valve Control Module	J338
Throttle Valve Drive	G186
Transmission Control Module (Automatic Transmission)	J217
Valve For Camshaft Adjustment	N205
Vehicle Speed Sensor (Speedometer)	G22
Wastegate By-Pass Regulator Valve	N75

DIAGNOSTIC TESTS

TESTING PRECAUTIONS

WARNING: For safety during road test, it is advisable to have a helper operate tester from rear seat. If test and measuring instruments are operated from front passenger's seat and vehicle is involved in an accident, there is a possibility the person sitting in this seat may receive serious injuries when air bag is deployed.

WARNING: Always use jack stands or hoist safeties when working on a raised vehicle.

WARNING: On some models fuel pump is activated by door contact switch. Always remove fuel pump fuse before opening fuel system. See appropriate

WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

WARNING: Turbocharger and related components operate at a very high temperature. Always allow system to cool or use proper protective clothing to prevent severe burns.

CAUTION: Perform all resistance and voltage tests with a Digital Volt-ohmmeter (DVOM) with minimum 10-megohm impedance, unless stated otherwise in test procedures. Ensure ignition switch is in OFF position when performing resistance tests.

NOTE: Read and record DTCs before starting diagnostic work, (some testing procedures will set DTCs).

NOTE: Before replacing any component, verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure all wiring is okay and connectors at component and ECM are clean and tight. When codes have been cleared or voltage supply to ECM has been interrupted, ECM loses all "learned" and "basic" values. Serious driveability problems may occur depending on vehicle mileage. After reconnecting ECM, it is necessary to perform relearn procedure. See TEST DRIVE RELEARN PROCEDURE .

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: When using Scan Tool VAG 1551/1552 or VAS 5051/5052, malfunctions which only occur sporadically (intermittently) will have the addendum sporadic (intermittent) malfunction on the print out and will be indicated on the display by the addendum /SP. Cause of sporadic malfunctions can be e.g. loose harness connector or an intermittently open circuit. If a sporadic malfunction does not occur again within 40 warm-up phases, sporadic DTC(s) will be erased from ECM memory. A warm-up phase is, engine started with coolant temperature below 122°F (50°C) - switched off at above 162°F (72°C).

NOTE: To properly diagnose vehicle, vehicle manufacturer recommends use of Scan Tool (VAG 1551/1552 or VAS 5051/5052) and Test Box (VAG 1598). Following test procedures are using Scan Tool (VAG 1551 or 1552) and Test Box (VAG 1598). Test box terminal numbers and ECM terminal numbers are identical. To identify connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

NOTE: **Before replacing any component, verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure all wiring is okay and connectors at component and ECM are clean and tight. When codes have been cleared or voltage supply to ECM has been interrupted, ECM loses all "learned" and "basic" values. Serious driveability problems may occur depending on vehicle mileage. After reconnecting ECM, it is necessary to perform relearn procedure. See TEST DRIVE RELEARN PROCEDURE .**

DTC P0010/16394, DTC P0011/16395 & DTC P0012/16396

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P0010/16394: Intake Camshaft Advance Adjustment - Malfunction
- DTC P0011/16395: Intake Camshaft Retard Adjustment - Specification Not Reached
- DTC P0012/16396: Intake Camshaft Advance Adjustment - Specification Not Reached

Circuit/Component Description

Camshaft adjustment occurs depending on engine load and RPM. Camshaft adjustment valve is opened by ECM, directing oil pressure to camshaft adjuster, which moves camshaft. Camshaft adjuster may fail either electrically or mechanically. After verifying or repairing electrical portion of system, camshaft adjuster may still be faulty. Repair camshaft adjuster mechanical failure as necessary. See step 6 under TESTING PROCEDURE.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Testing Procedure

NOTE: **Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.**

1. **NOTE:** **When using scan tool to activate camshaft adjustment valve, it is barely**

audible. Use mechanics stethoscope if necessary.

Electrical Circuit Test - Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Using scan tool, activate camshaft adjustment valve. See **OUTPUT DIAGNOSTIC TEST MODE** . Camshaft adjustment valve should audibly click. If valve clicks, go to step 6 . If valve does not click, go to next step.

2. Using DVOM, check resistance of camshaft adjustment valve. See **Fig. 16** . Resistance should be 10-18 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty camshaft adjustment valve. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Disconnect camshaft adjustment valve harness connector. See **Fig. 15** . Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to camshaft adjustment valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of camshaft adjustment valve. Turn ignition off. Replace faulty camshaft adjustment valve. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using DVOM, measure resistance between camshaft adjustment valve connector terminal No. 2 and test box socket No. 115. See **Fig. 17** . Record resistance reading. Resistance should be a maximum of 1.5 ohms. Check camshaft adjustment valve harness connector terminal No. 2 for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Using DVOM, check resistance between camshaft adjustment valve connector terminal No. 1 and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6.

NOTE: An aftermarket scan tool may not be able to perform mechanical test procedure properly. Manufacturer recommends using VAG 1551/1552 or VAS 5051/5052.

Mechanical Test - Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and bring to operating temperature. On Beetle, GTI and Jetta with engine code (AWP), go to next step. On Beetle, GTI and Jetta with engine code (AWV & AWW), go to step 8 . Passat, go to step 9 .

7. Place transmission in neutral (M/T) or Park (A/T). Set parking brake. Depress and hold brake pedal. Accelerate to Wide Open Throttle (WOT). Engine speed will increase (by ECM) to approximately 2300 RPM. Continue to hold brake pedal and maintain engine speed. Observe camshaft adjuster on scan tool. Scan tool will operate camshaft adjuster from off to on. Continue to hold brake pedal and maintain engine

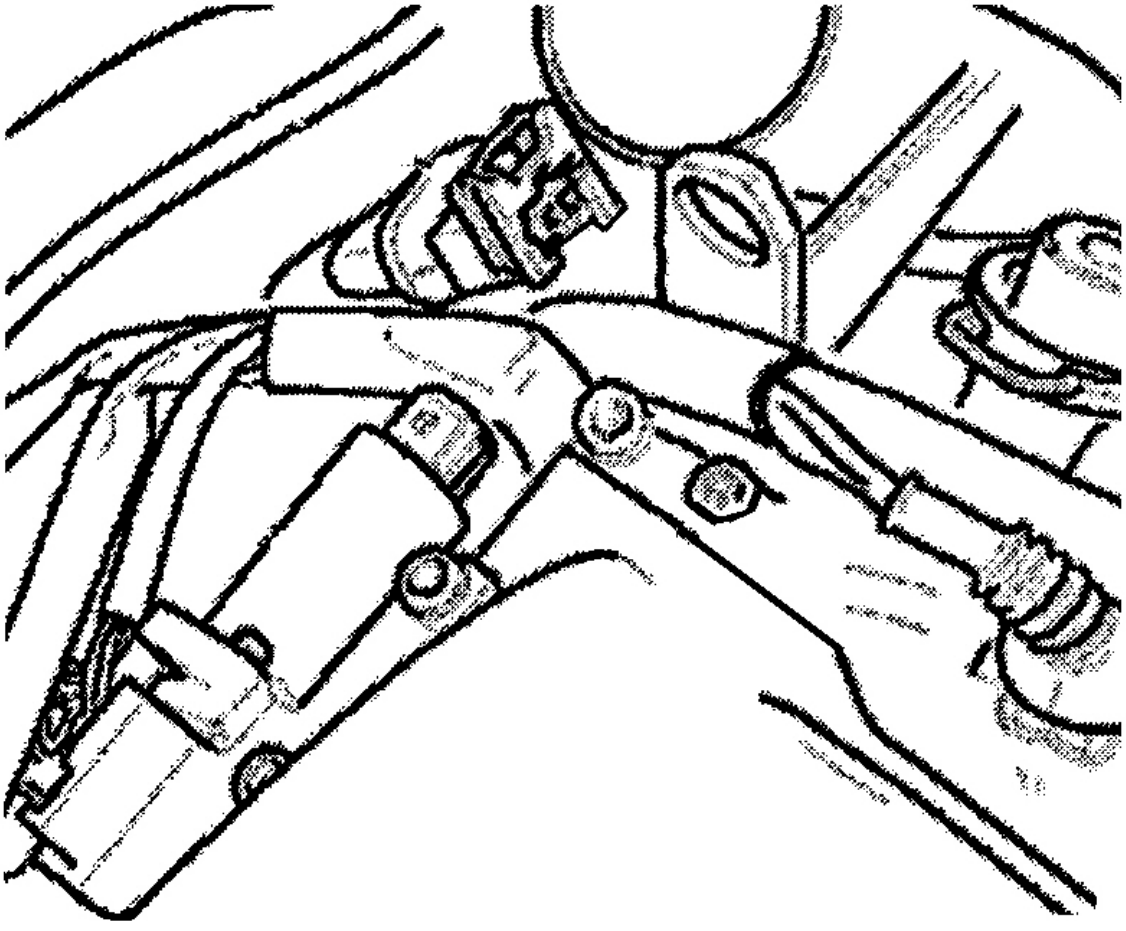
speed until scan tool indicates system is okay. If scan tool indicates system is okay, mechanical test is okay. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If scan tool does not indicate system is okay, read DTC memory. If DTC P1519/17927 appears, it may be because camshaft adjustment valve correctly switches oil pressure to mechanical camshaft adjuster, but camshaft adjuster cannot reach its end position, (e.g. tight/partially seized). Repair or replace faulty camshaft adjuster as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

8.

NOTE: An aftermarket scan tool may not be able to perform mechanical test procedure properly. Manufacturer recommends using VAG 1551/1552.

Place transmission in neutral (M/T) or Park (A/T). Set parking brake. Using accelerator pedal prop, manually set engine speed to 1800-2200 RPM. Observe camshaft adjuster on scan tool. Scan tool will operate camshaft adjuster from off to on. Continue to maintain engine speed until scan tool indicates system is okay. If scan tool indicates system is okay, mechanical test is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If scan tool does not indicate system is okay, read DTC memory. If DTC P1519 (VAG will display DTC 17927) appears, it may be because camshaft adjustment valve correctly switches oil pressure to mechanical camshaft adjuster, but camshaft adjuster cannot reach its end position, (e.g. tight/partially seized). Repair or replace faulty camshaft adjuster as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

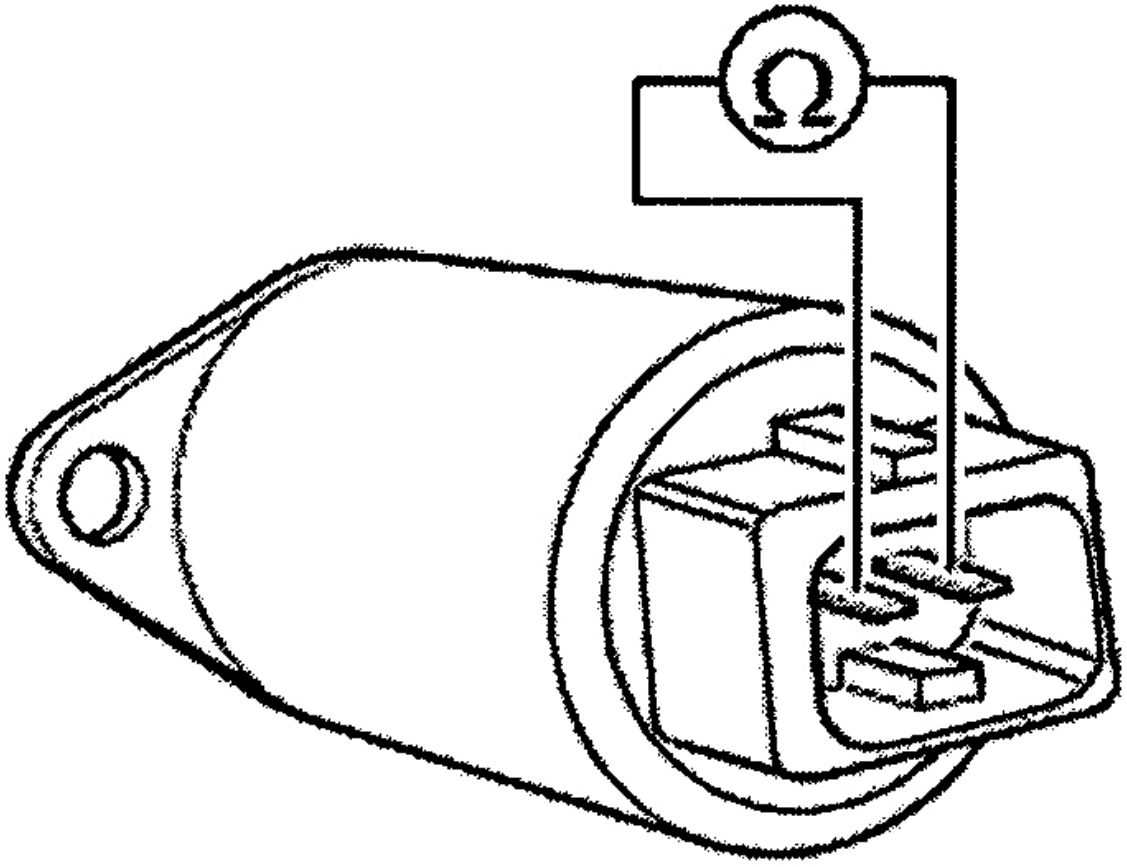
9. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and bring to operating temperature. Using scan tool. Check camshaft adjustment at idle. Specification with engine code (AWM) is CAM-ADJ.ON. Check camshaft adjustment under load. With a helper to operate tester from rear seat. Observe scan tool readings. From a stop, accelerate to Wide Open Throttle (WOT) in 1st gear (M/T), 2nd (A/T) to over 3200 RPM. If scan tool indicates system is okay, mechanical test is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If scan tool does not indicate system is okay. It may be because camshaft adjustment valve correctly switches oil pressure to mechanical camshaft adjuster, but camshaft adjuster cannot reach its end position, (e.g. tight/partially seized). Repair or replace faulty camshaft adjuster as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083337

Fig. 15: Disconnecting Camshaft Adjustment valve (Beetle, GTI & Jetta - Engine Code AWV, AWW & AWP)

Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083338

Fig. 16: Checking Camshaft Adjustment Valve Resistance (Beetle, GTI & Jetta - Engine Code AWV, AWW & AWP)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

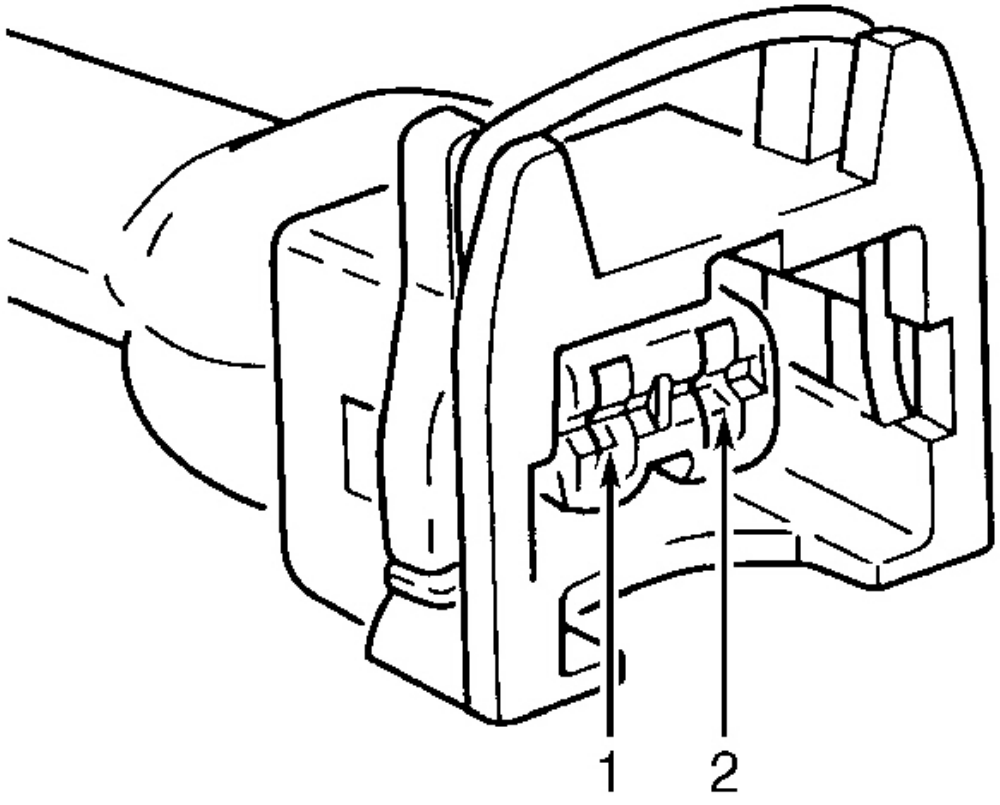


Fig. 17: Identifying Test Points On 2-Pin Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0030/16414, DTC P0031/16415 & DTC P0032/16416

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

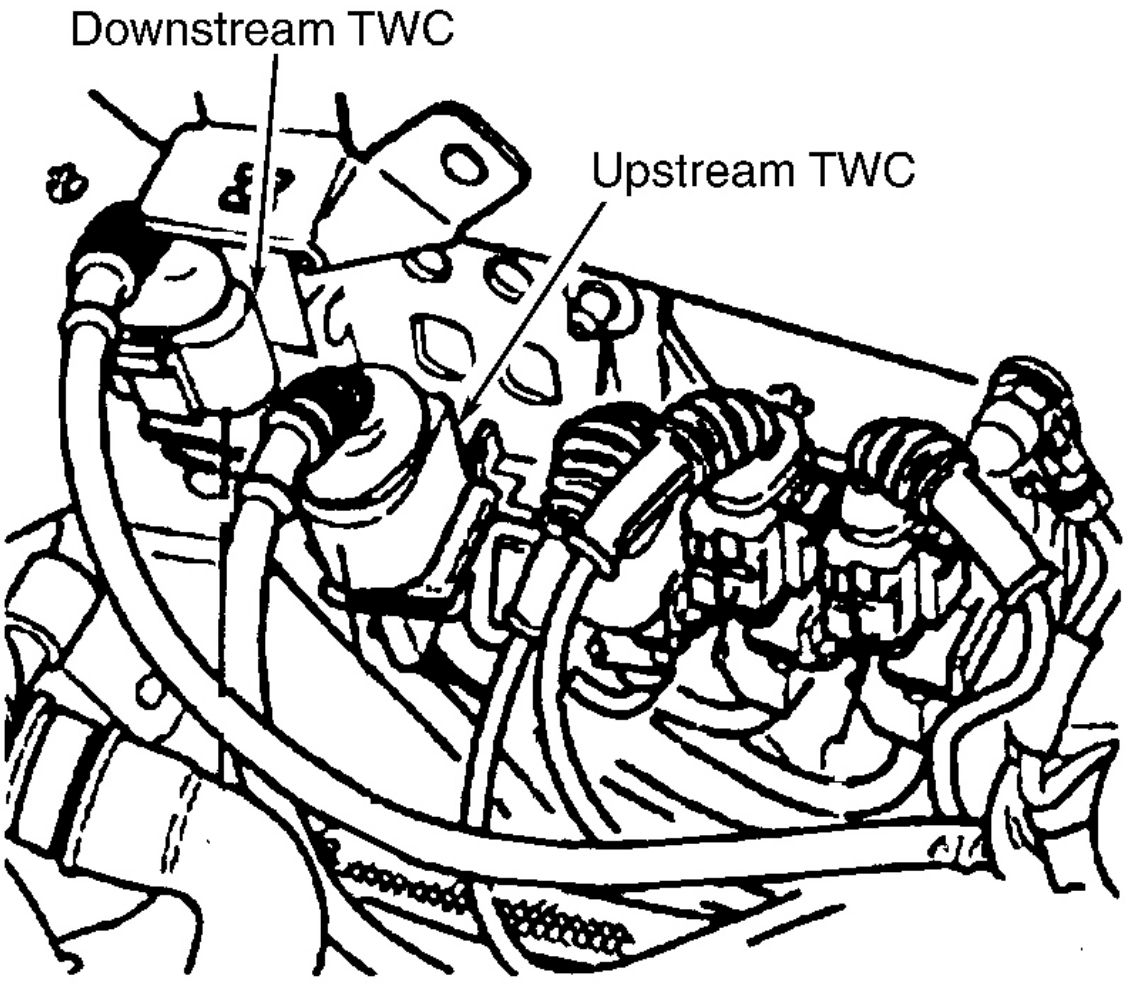
- DTC P0030/16414: HO2 Sensor (G39) Upstream TWC - Heating Open Circuit
- DTC P0031/16415: HO2 Sensor (G39) Upstream TWC - Heating Short To Ground
- DTC P0032/16416: HO2 Sensor (G39) Upstream TWC - Heating Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

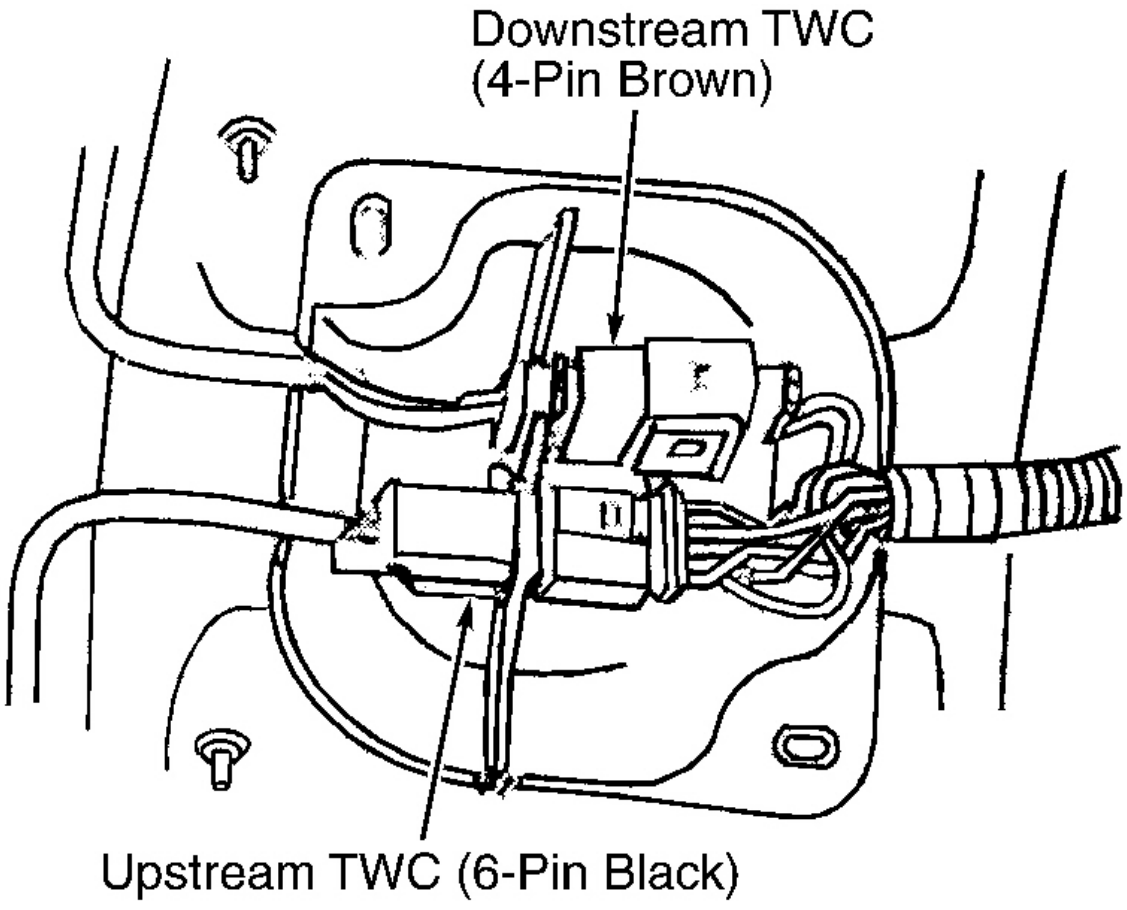
1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn off ignition. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.



G00083386

Fig. 18: Locating & Identifying Heated Oxygen Sensors, Located At Firewall Behind Coolant Tank (Passat)

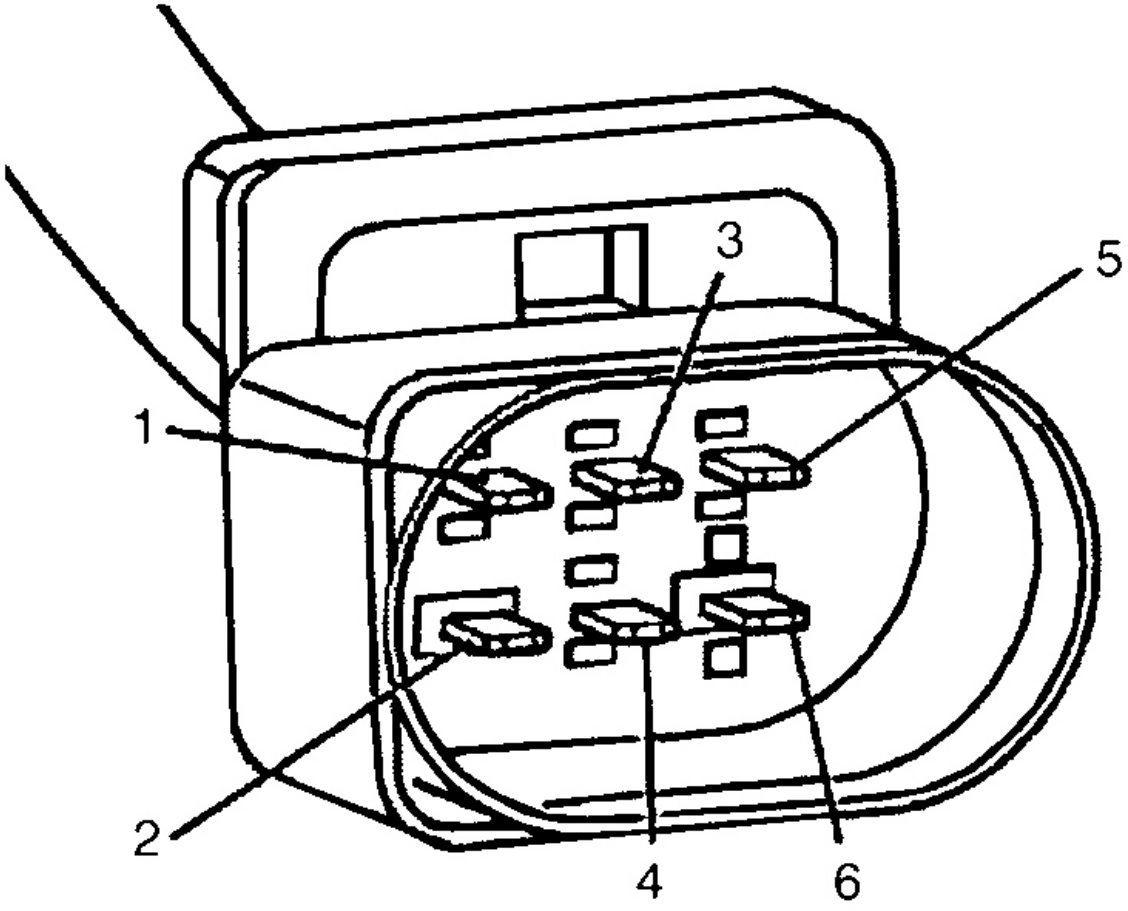
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083385

Fig. 19: Locating Heated Oxygen Sensors Protective Cover & Identifying Harness Connectors (Beetle, GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 20** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00095569

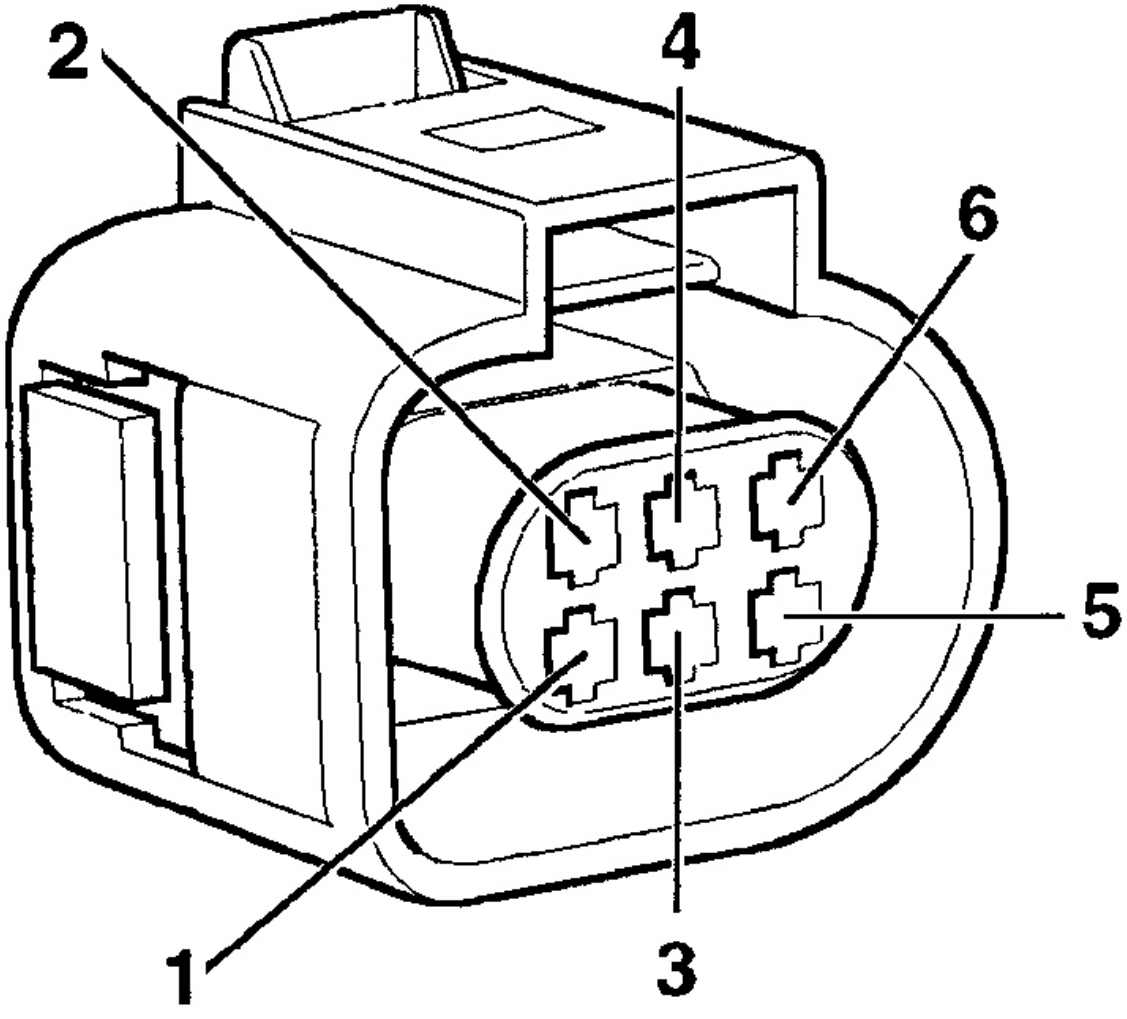
Fig. 20: Identifying 6-Pin Sensor Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 21** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 21** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7.

NOTE: Before replacing ECM check HO2S control signal. See DTC P0131/16515 & DTC P0132/16516 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.

Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 21** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073531

Fig. 21: Identifying Heated Oxygen Sensor Harness Connector Terminals - Upstream TWC

Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0036/16420, DTC P0037/16421 & DTC P0038/16422

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0036/16420: HO2 Sensor (G130) Downstream TWC - Heating Open Circuit
- DTC P0037/16421: HO2 Sensor (G130) Downstream TWC - Heating Short To Ground
- DTC P0038/16422: HO2 Sensor (G130) Downstream TWC - Heating Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

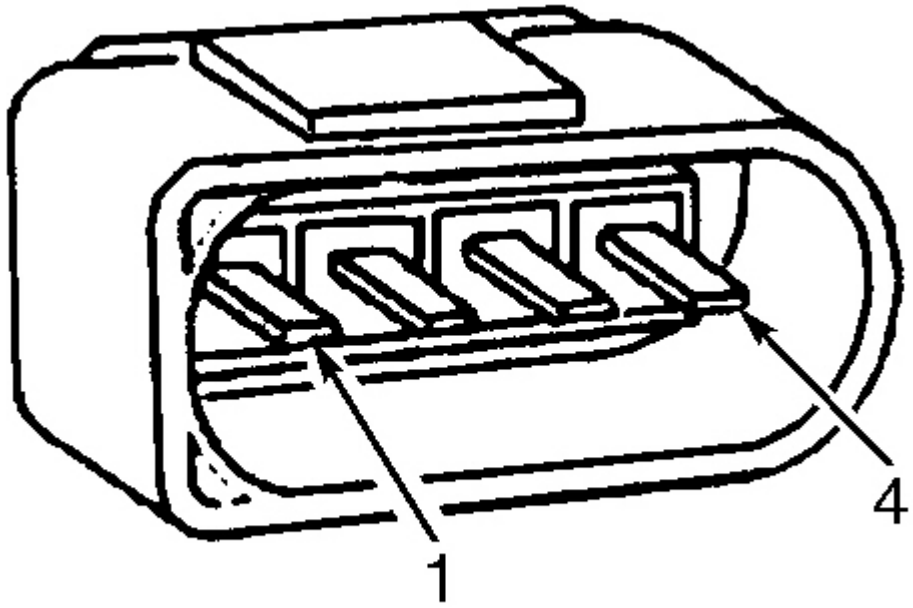
1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (brown 4-pin), see **Fig. 19** . Go to next step.
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 22** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 23** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness

connector terminal No. 1 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 23** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 23** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083387

Fig. 22: Identifying Heated Oxygen Sensor Terminals - Downstream TWC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

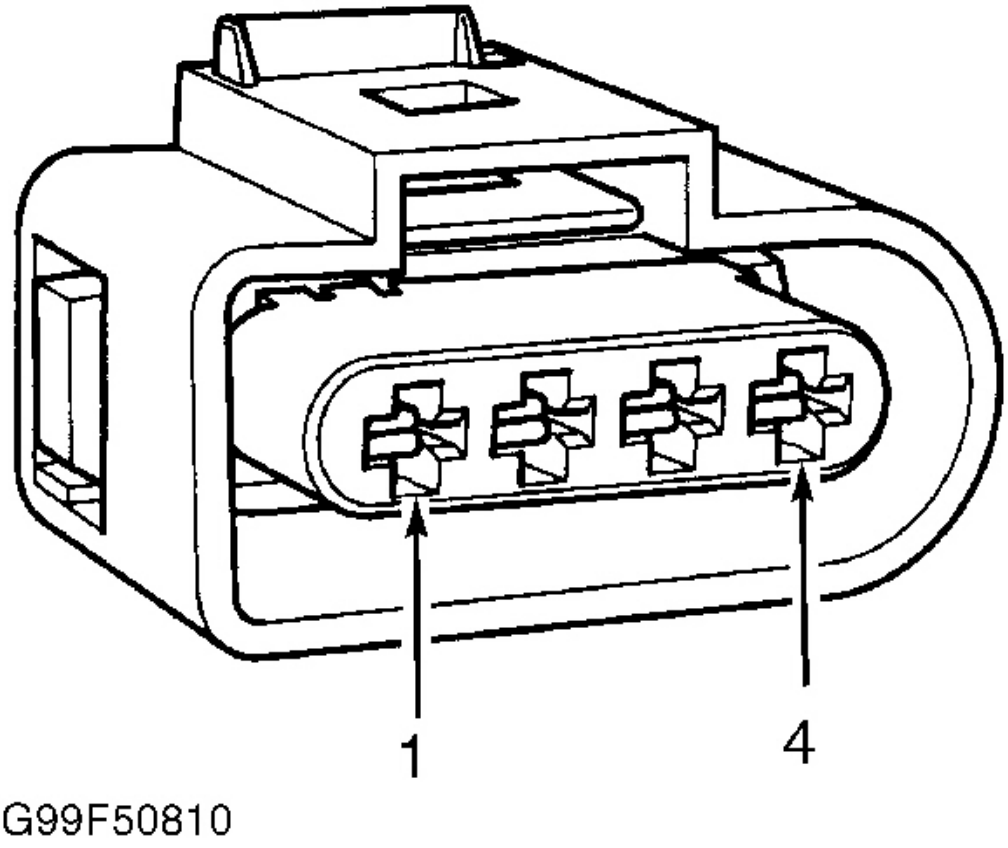


Fig. 23: Identifying Heated Oxygen Sensor Harness Connector Terminals - Downstream TWC
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487

Code Definition

- DTC P0101/16485: MAF Sensor (G70) - Implausible Signal
- DTC P0102/16486: MAF Sensor (G70) - Voltage Signal To Low
- DTC P0103/16487: MAF Sensor (G70) - Voltage Signal To High

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure no exhaust system leaks exist. Engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T,

selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Inspect air induction system for leaks. Check air filter for blockage. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle. Using scan tool, check air mass drawn in by engine. Air mass should be 2.0-4.5 grams/second at idle. If air mass reading is okay, go to next step (voltage supply for MAF sensor must be checked). If air mass reading is not okay, go to step 6 .
3. Turn ignition off. Disconnect MAF sensor 5-pin connector. Using DVOM, measure voltage between MAF sensor 5-pin connector, terminal No. 2 and ground. See **Fig. 24** . Start engine and idle. Voltage should be 11-15 volts. If voltage is okay, go to step 5 . If voltage is not okay, go to next step.
4. Turn ignition off. Repair wiring from MAF sensor 5-pin connector, terminal No. 2 and fuel pump relay (J17). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition on. Using DVOM, check voltage between MAF sensor 5-pin connector, terminal No. 4 and ground. See **Fig. 24** . Voltage should be 4.5-5.5 volts. If voltage is okay, go to next step (further circuit tests are required). If voltage is not okay, go to next step.
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following MAF sensor (G70) connector terminals and test box sockets. See **Fig. 24** .
   - MAF sensor harness connector terminal No. 3 and test box socket No. 27.
   - MAF sensor harness connector terminal No. 4 and test box socket No. 53.
   - MAF sensor harness connector terminal No. 5 and test box socket No. 29.

   Resistance should be a maximum of 1.5 ohms for each reading. If resistance measurements are okay, go to next step. If any resistance measurement is not okay, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Using DVOM, check wiring in MAF sensor 5-pin connector for short circuit to one another, short circuit to ground, and short circuit to B+. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If circuits are okay, go to next step.
8. If all wiring, voltage checks, and grounds are okay, and DTC P0101/16485, DTC P0102/16486 or DTC P0103/16487 return, replace faulty MAF sensor (G70). After repairs, erase DTC memory. Verify Repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

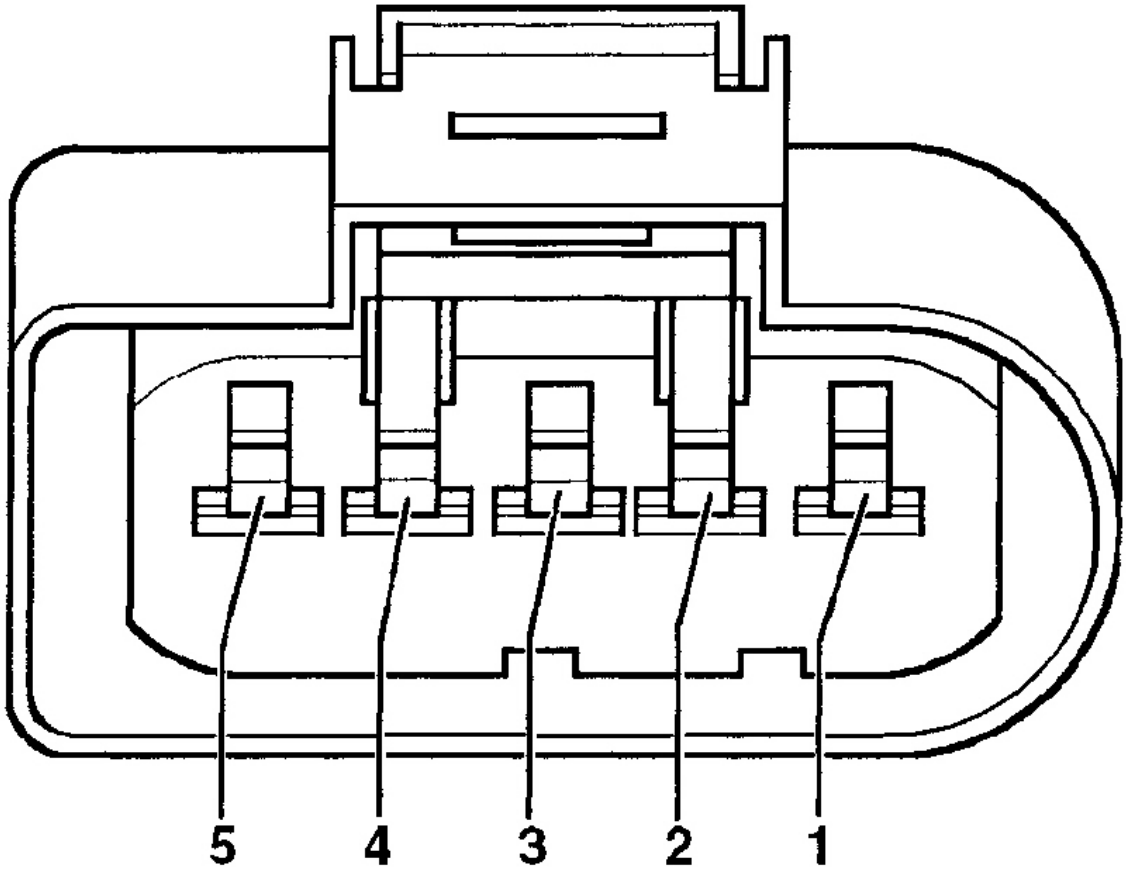


Fig. 24: Identifying Mass Airflow Sensor Harness Connector Terminals (G70)
Courtesy of AUDI OF AMERICA, INC.

DTC P0106/16490, DTC P0107/16491 & DTC P0108/16492

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0106/16490: Charge Air Pressure Sensor (G31) Barometric Pressure Sensor (F96) - Implausible Signal
- DTC P0107/16491: Charge Air Pressure Sensor (G31) Barometric Pressure Sensor (F96) - Signal Too Small
- DTC P0108/16492: Charge Air Pressure Sensor (G31) Barometric Pressure Sensor (F96) - Signal Too Large

NOTE: No DTCs other than DTC P0106/16490, DTC P0107/16491 and/or DTC

P0108/16492 should be stored. Ensure any engine-related mechanical problems are corrected before testing turbocharger.

NOTE: DTC P0106/16490 pertains to all models. DTC P0107/16491 and P0108/16492 are for Passat only. For connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. For component locations, COMPONENT LOCATIONS .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure - Turbocharger, Charge Pressure (Beetle - Engine Code AWV)

1. Using a "T" fitting, install Turbocharger Tester (VAG 1397A) in intake manifold to charge pressure by-pass valve hose. Select measuring range I on turbocharger tester.

CAUTION: Test duration during measurement should be limited to a maximum of 10 seconds.

2. With a helper to operate tester from rear seat. Accelerate to wide open throttle from 2000 RPM in 3rd gear (M/T) or position "2" (A/T). Press "M" button on turbocharger tester when engine speed is at 3000 RPM. Boost pressure should be 18.5-20.5 psi (1.3-1.4 bar).
3. If specified boost pressure is exceeded, go to next step. If specified boost pressure is not as specified, check wastegate by-pass regulator. See **DTC P0243/16627, DTC P0245/16629 & DTC P0246/16630** and replace as necessary. Repeat turbocharger test.
4. Check for blockage between charge air cooler and turbocharger. Check wastegate and operating rod operation. Ensure wastegate by-pass valve is securely mounted to turbocharger. Repair as necessary. Check for stuck wastegate due to corrosion. If valve is stuck, replace turbocharger. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Turbocharger, Charge Pressure (Beetle - Engine Code AWP; GTI, Jetta & Passat)

NOTE: Beetle with engine code (AWP), GTI, Jetta and Passat turbocharger performance engine may only be checked using a scan tool.

1. Start engine and idle. With a helper to operate tester from rear seat. Using scan tool check duty cycle of wastegate by-pass regulator valve. Accelerate to Wide Open Throttle (WOT). Observe duty cycle percentage in the 1800-2300 RPM range. Record readings. Duty cycle reading should be from 5 to 95 percent. If reading is okay, go to next step. If reading is not okay, see **CHARGE AIR PRESSURE SENSOR** and **DTC P0243/16627, DTC P0245/16629 & DTC P0246/16630** and replace as necessary. Repeat step 1 .

CAUTION: Test duration during measurement should be limited to a maximum of 10 seconds.

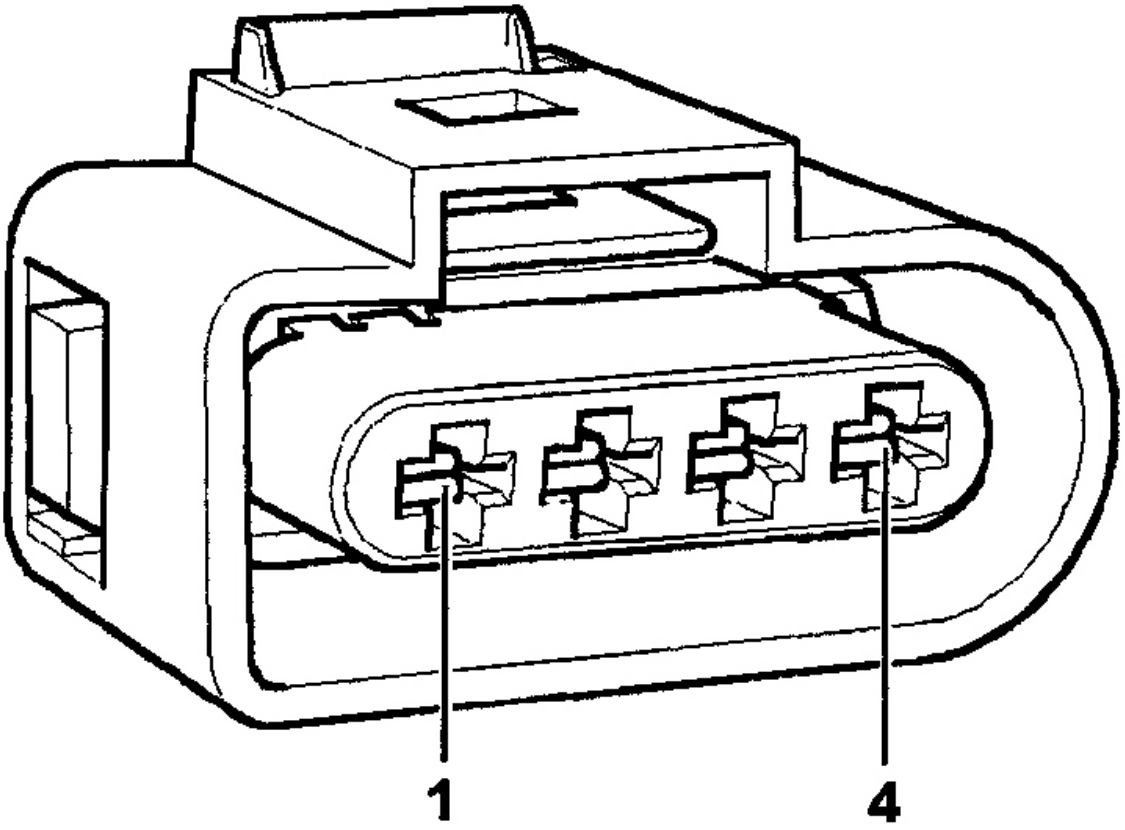
2. With a helper to operate tester from rear seat. Using scan tool check actual boost pressure at WOT. Accelerate to wide open throttle from low speed in 2nd gear (M/T) or 4th gear with Tiptronic System (A/T). Press VAG 1551 PRINT button when engine speed is between 1800-2300 RPM. Read boost value. Boost value should be 19.6-25.4 psi (1.35-1.75 bar). For engine code AWP boost value should be 24.7-29.0 psi (1.70-2.00 bar). Compare actual boost pressure with specification in display field 3. maximum difference is 1.5 psi (.1 bar). Repeat measurement if boost pressure was not fully charged or difference between actual and specified values was to large.
3. If boost pressure reading is not okay, see **CHARGE AIR PRESSURE SENSOR** and **DTC P0243/16627, DTC P0245/16629 & DTC P0246/16630** . If boost pressure is still not okay check turbocharger for damage or blockage, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Charge Air Pressure Sensor (All Models)

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Go to next step.
2. Disconnect Charge Air Pressure sensor 4-pin harness connector. See **COMPONENT LOCATIONS** . Turn ignition on. Using DVOM measure voltage between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector. See **Fig. 25** . Voltage should be a minimum of 4.5 volts. Turn ignition off. If readings are okay, go to next step. If readings are not okay, go to next step.
3. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following Charge Air Pressure sensor harness connector terminals and test box sockets. See **Fig. 25** .
   - Charge Air Pressure sensor harness connector terminal No. 1 and test box socket No. 108.
   - Charge Air Pressure sensor harness connector terminal No. 3 and test box socket No. 98.
   - Charge Air Pressure sensor harness connector terminal No. 4 and test box socket No. 101.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in Charge Air Pressure sensor 4-pin harness connector for short circuits to one another. Go to next step.
4. If Charge Air Pressure sensor harness connector circuits are okay and 4.5 volts minimum is present between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector, go to next step. If Charge Air Pressure sensor harness connector circuits are okay, but no voltage is present between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Leave ECM harness connected to Test Box (VAG 1598/31) and connect ECM to Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Start engine and idle. Using DVOM, check voltage between test box sockets No. 101 and 108. For all models except Beetle (engine code AWV) voltage should be 1.8-2.0 volts at idle. For Beetle (engine code AWV) voltage should be 0.4-0.5 volts at idle. Observe DVOM and briefly accelerate from idle to wide open throttle. For all models, voltage reading should be 2.0-3.0 volts. If voltage readings are okay, Charge Air Pressure sensor is okay. Erase DTC

memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If voltage readings are not okay, replace Charge Air Pressure sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073511

Fig. 25: Identifying Test Points On Charge Air Pressure Sensor (G31)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0112/16496 & DTC P0113/16497

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0112/16496: IAT Sensor (G42) - Signal Too Low
- DTC P0113/16497: IAT Sensor (G42) - Signal Too High

NOTE: If sensor or wiring is defective, ECM operates with a substitute intake air

temperature of 67.1°F (19.5°C). For harness connector terminal wire colors, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

NOTE: Engine must be cold before performing test procedure.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Connect Scan Tool . See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Go to next step.
2. Turn ignition on. Using scan tool, check IAT sensor temperature value. If IAT sensor temperature value deviates greatly from underhood ambient temperature, go to step 5 . If IAT sensor temperature value is approximately the same as underhood ambient temperature, go to next step.
3. **NOTE: Next test step tests IAT sensor through its full range.**

   Turn ignition off. Disconnect IAT sensor harness connector. For IAT sensor location. See **COMPONENT LOCATIONS** . Remove IAT sensor from intake plenum. Reconnect IAT sensor harness connector. Turn ignition on. Using a chilling agent, cool IAT sensor. Using scan tool, observe IAT sensor temperature value. Temperature value should steadily decrease. If IAT sensor temperature value steadily decreased, go to next step. If IAT sensor temperature value did not steadily decrease, replace faulty IAT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Erase DTC memory. Test drive vehicle. If DTC P0112/16496 or DTC P0113/16497 returns, go to step 8 . If DTC P0112/16496 or DTC P0113/16497 does not return, test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. If IAT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step. If IAT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 7 .
6. Disconnect IAT sensor harness connector. For IAT sensor location. See **COMPONENT LOCATIONS** . Using a jumper wire, bridge IAT sensor harness connector terminals No. 1 and 2. Using scan tool, observe IAT sensor temperature value. If IAT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 8 . If IAT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty IAT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect IAT sensor harness connector. For IAT sensor location. See **COMPONENT LOCATIONS** . Using scan tool, observe IAT sensor temperature value. If after disconnecting IAT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty IAT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST**

DRIVE RELEARN PROCEDURE . If after disconnecting IAT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step.

8. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect IAT sensor harness connector. Using DVOM, measure resistance between IAT sensor harness connector terminal No. 1 and test box socket No. 85. See **Fig. 17** . Record resistance reading. Using DVOM, measure resistance between IAT sensor harness connector terminal No. 2 and test box socket No. 108. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
9. Check IAT sensor harness connector terminal No. 1 for short circuit to battery positive and ground. Check IAT sensor harness connector terminal No. 2 for short circuit to battery positive. Also verify IAT sensor harness connector circuits are not shorted to each other. Repair wiring harness as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and IAT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IAT SENSOR RESISTANCE

Temperature - °F (°C)	Ohms
86 (30)	1500-2000
104 (40)	1000-1500
122 (50)	800-1000
140 (60)	500-700
158 (70)	375-500
176 (80)	275-375
194 (90)	225-275

DTC P0116/16500, DTC P0117/16501 & DTC P0118/16502

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0116/16500: ECT Sensor (G62) - Implausible Signal
- DTC P0117/16501: ECT Sensor (G62) - Signal Too Low
- DTC P0118/16502: ECT Sensor (G62) - Signal Too High

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant system and engine coolant system thermostat are in good working order.

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: Engine must be cold before performing test procedure.

NOTE: To bleed cooling system, fill cooling system. Warm engine to operating temperature, (run engine until coolant fan starts), do not allow engine to overheat, let engine cool and recheck coolant level.

1. Disconnect ECT sensor harness connector. See **Fig. 26** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals No. 1 and 3. See **Fig. 27** . See **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551) and (VAG 1552) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 26** . Using a jumper wire, bridge terminal with Brown/Blue wire and terminal No. 3 of ECT sensor harness connector. See **Fig. 28** . Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Disconnect ECT sensor harness connector. See **Fig. 26** . Using scan tool, observe ECT sensor

temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor 4-pin harness connector. See **Fig. 26** . Using DVOM, measure resistance between ECT sensor harness connector terminal with Brown/Blue wire and test box socket No. 108. See **Fig. 28** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 3 and test box socket No. 93. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 108. Check ECT sensor harness connector terminal No. 3 sensor for short circuit to battery positive and ground. Check Brown/Blue wire on ECT sensor harness connector for short circuit to B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Beetle, GTI & Jetta (Engine Code AWP)

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: Engine must be cold before performing test procedure.

NOTE: To bleed cooling system, fill cooling system. Warm engine to operating temperature, (run engine until coolant fan starts), do not allow engine to overheat, let engine cool and recheck coolant level.

1. Disconnect ECT sensor harness connector. See **Fig. 29** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals C and D. See **Fig. 30** and **ECT (G62) SENSOR RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551/1552) and (VAS 5051/5052) displays temperature in 1

to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 29** . Using a jumper wire, bridge terminal with Brown/Blue wire and terminal No. 3 of ECT sensor harness connector. See **Fig. 32** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Disconnect ECT sensor harness connector. See **Fig. 29** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor 4-pin connector. See **Fig. 29** . Using DVOM, measure resistance between ECT sensor harness connector terminal No. 3 and test box socket No. 93. See **Fig. 32** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 4 and test box socket No. 108. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 108. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive and ground. Check ECT sensor harness connector terminal No. 4 for short circuit to battery positive. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Passat

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: Engine must be cold before performing test procedure.

NOTE: To bleed cooling system, fill cooling system. Warm engine to operating temperature, (run engine until coolant fan starts), do not allow engine to overheat, let engine cool and recheck coolant level.

1. Disconnect ECT sensor harness connector. See **Fig. 31** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals C and D. See **Fig. 30** . See **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Go to next step.
2. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551) and (VAG 1552) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

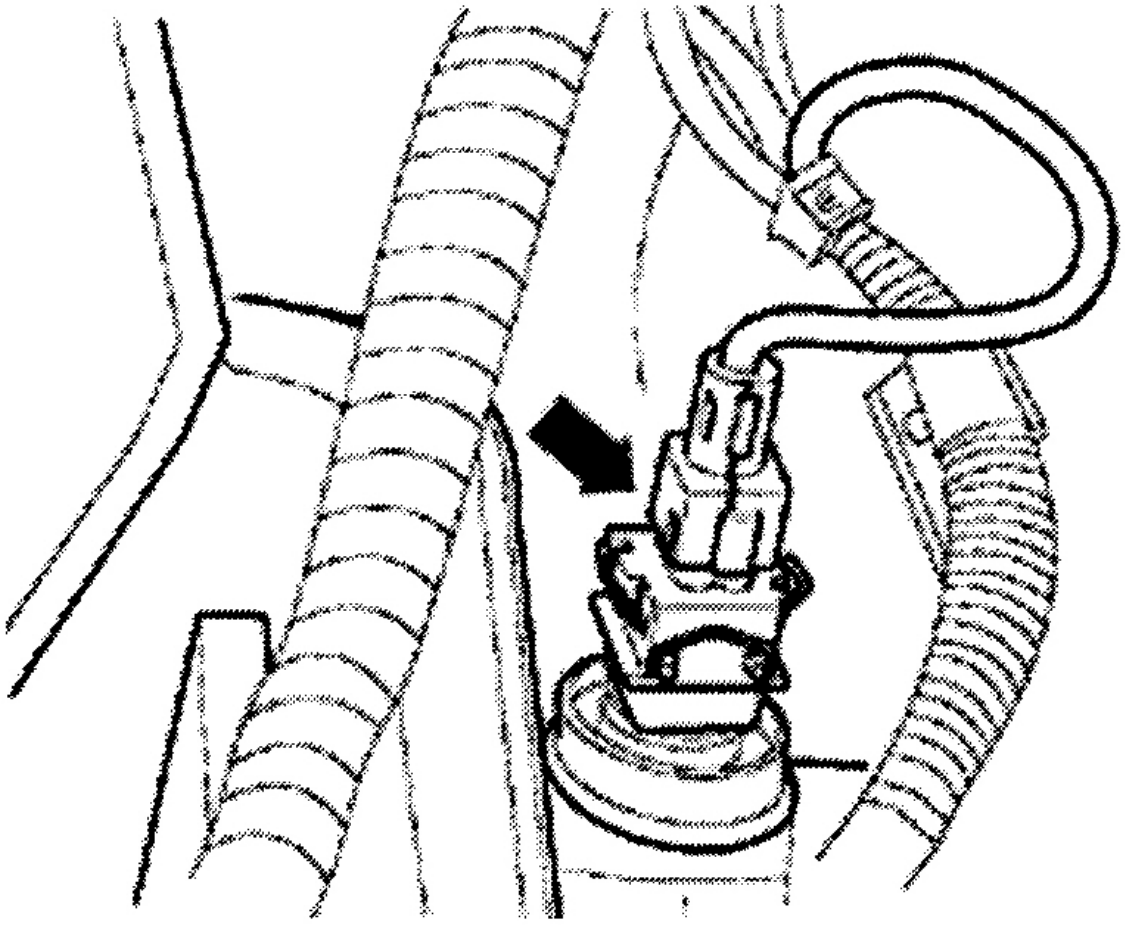
   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 31** . Using a jumper wire, bridge terminals No. 3 and 4 of ECT sensor harness connector. See **Fig. 32** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Disconnect ECT sensor harness connector. See **Fig. 31** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor 4-pin harness connector. See **Fig. 31** . Using DVOM, measure resistance between ECT sensor harness connector terminal No. 3 and test box socket No. 108. See **Fig. 32** . Record resistance reading. Measure

resistance between ECT sensor harness connector terminal No. 4 and test box socket No. 93. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.

8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 93. Check ECT sensor harness connector terminal No. 4 for short circuit to battery positive and ground. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

ECT SENSOR (G62) RESISTANCE

Temperature °F (°C)	Ohms
86 (30)	1500-2000
104 (40)	1000-1500
122 (50)	800-1000
140 (60)	500-700
158 (70)	375-500
176 (80)	275-375
194 (90)	225-275



G00083348

Fig. 26: Locating ECT Sensor (G62 - Beetle - Engine Code AWV)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

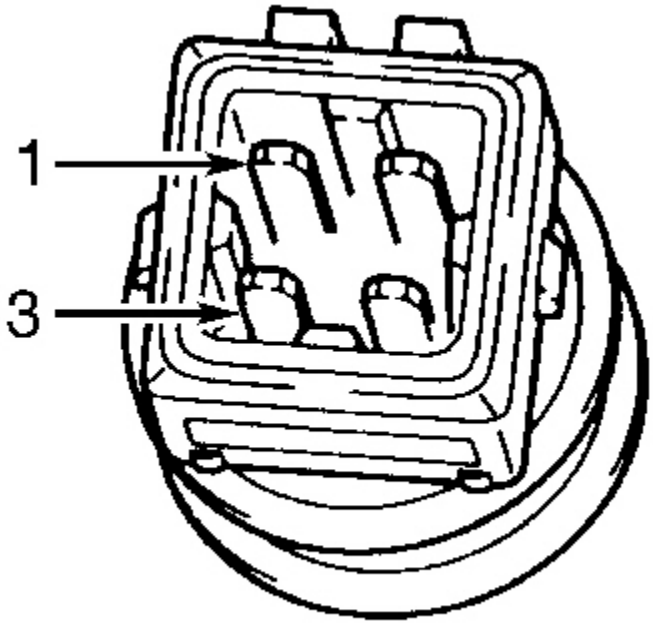


Fig. 27: Testing ECT Sensor (G62 - Beetle - Engine Code AWV)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

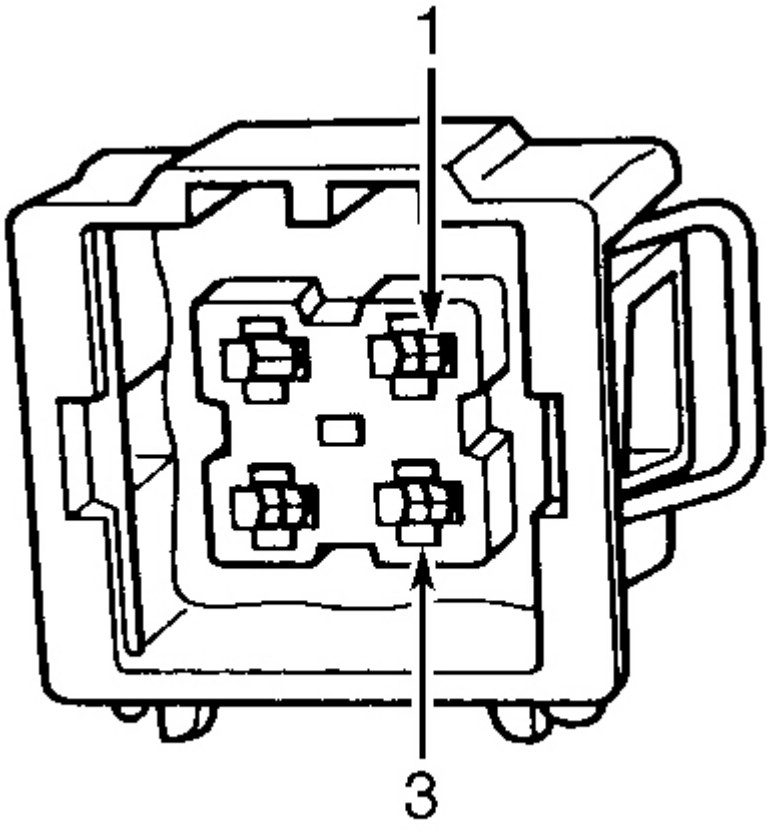
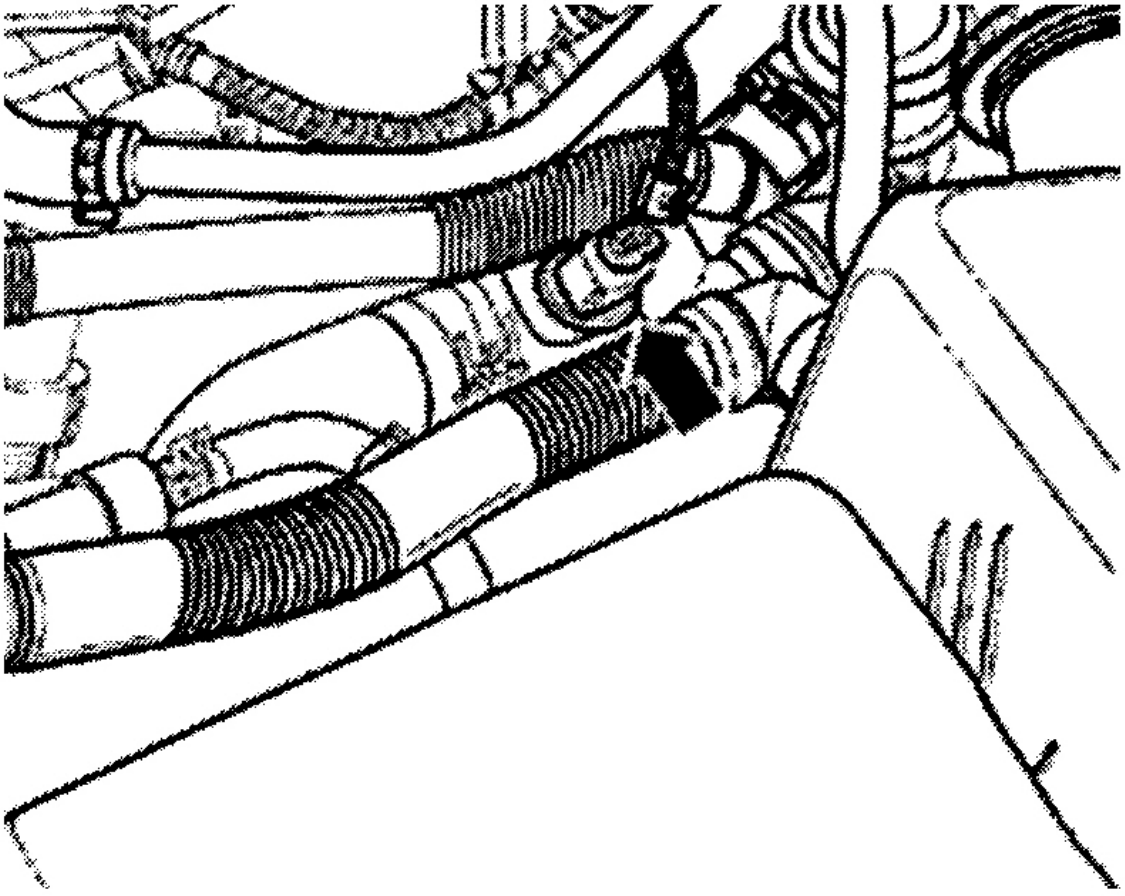


Fig. 28: Identifying Test Points On ECT Sensor (G62) Harness Connector (Beetle - Engine Code AWV)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083350

Fig. 29: Locating ETC Sensor (G62 - Beetle - Engine Code AWP, GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

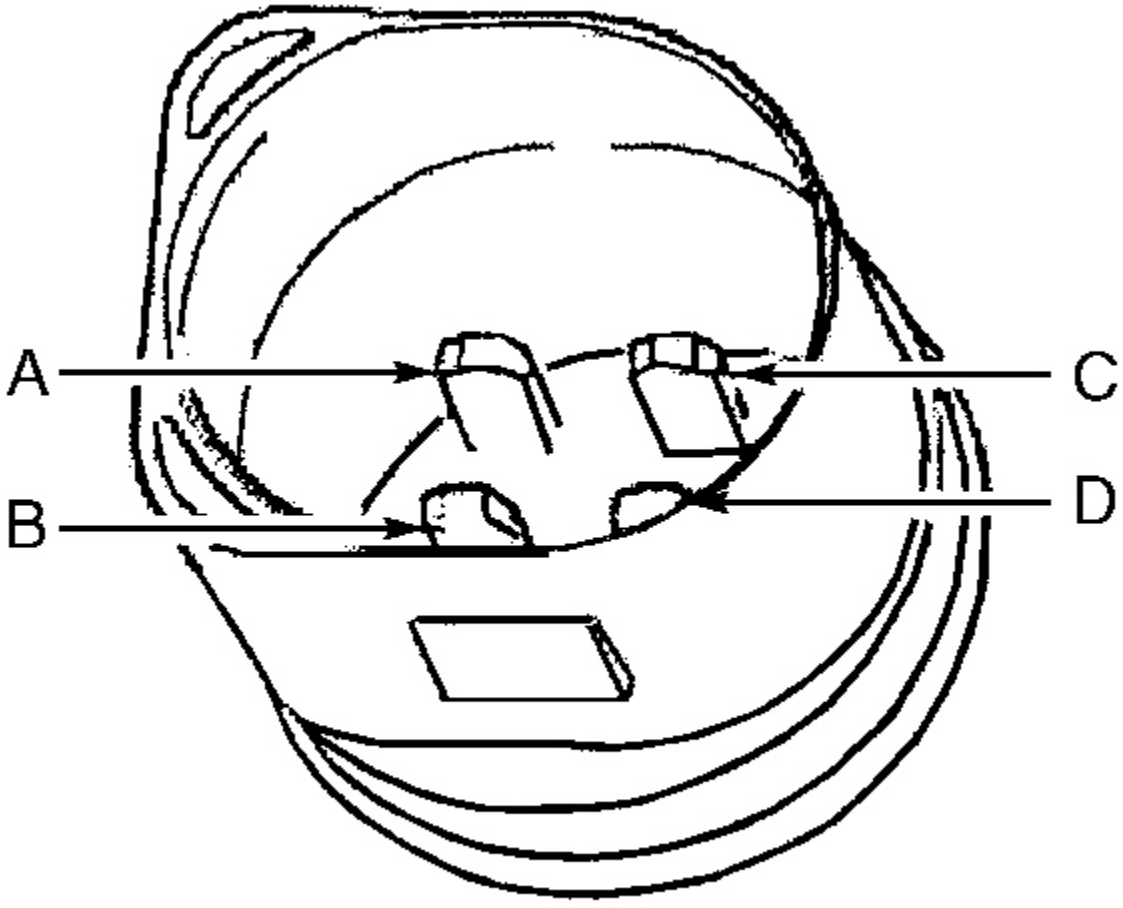
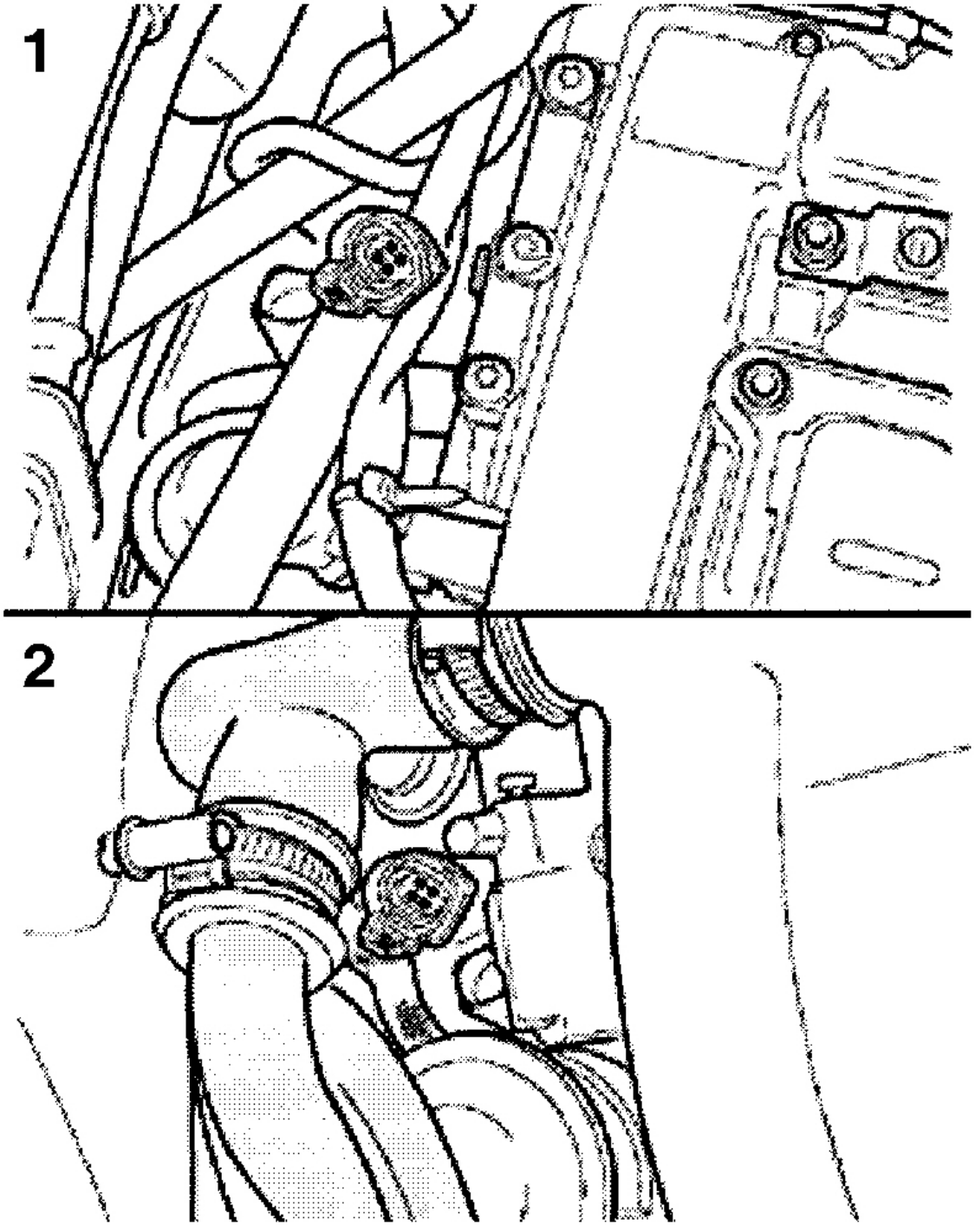


Fig. 30: Testing ECT Sensor (G62 - Beetle - Engine Code AWP, GTI, Jetta & Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083356

Fig. 31: Locating ECT Sensor (G62 - Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

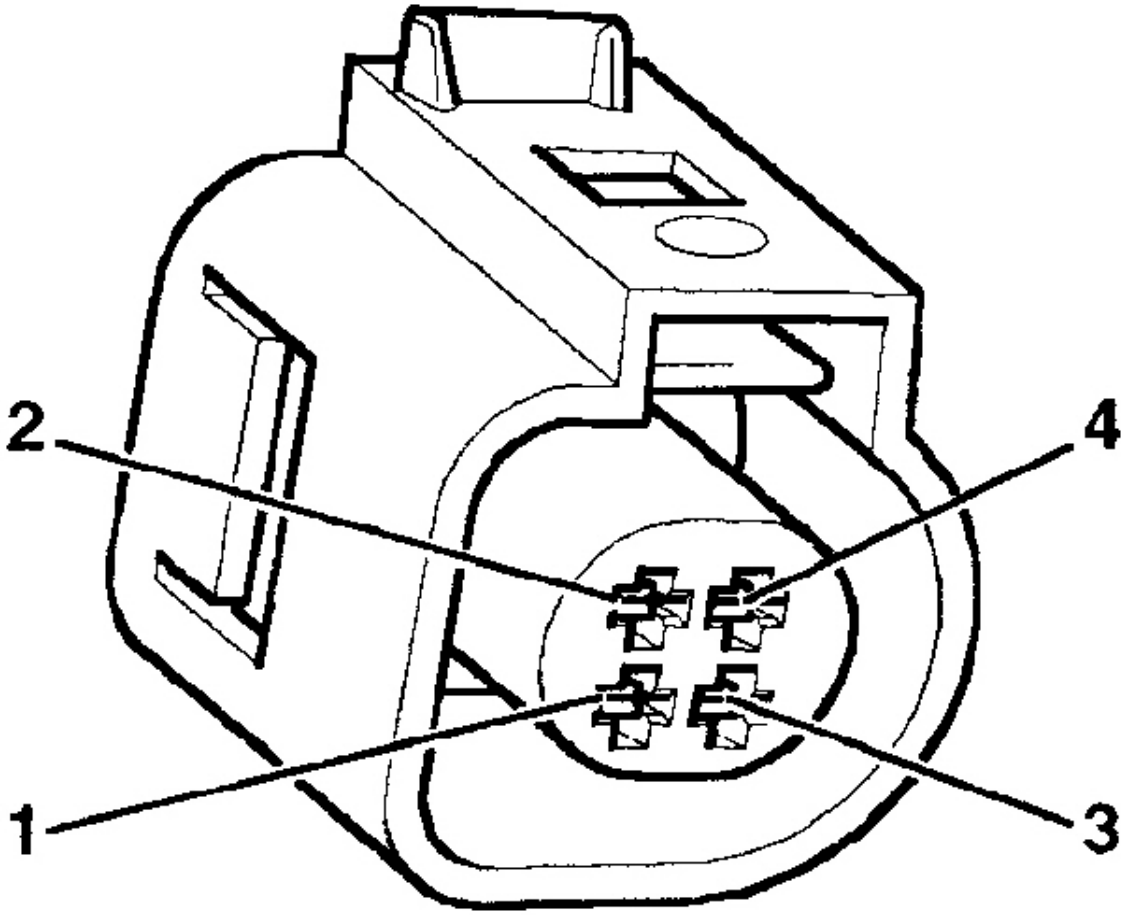


Fig. 32: Identifying Test Points On ECT Sensor (G62) Harness Connector (Beetle, GTI & Jetta - Engine Code AWP, Passat - Engine Code AWM)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0121/16505, DTC P0122/16506 & DTC P0123/16507

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P0121/16505: Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal
- DTC P0122/16506: Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
- DTC P0123/16507: Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-93 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check Accelerator Pedal Position (APP) sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185),**

IMPLAUSIBLE SIGNAL . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.

5. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt accelerator pedal position sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118
6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

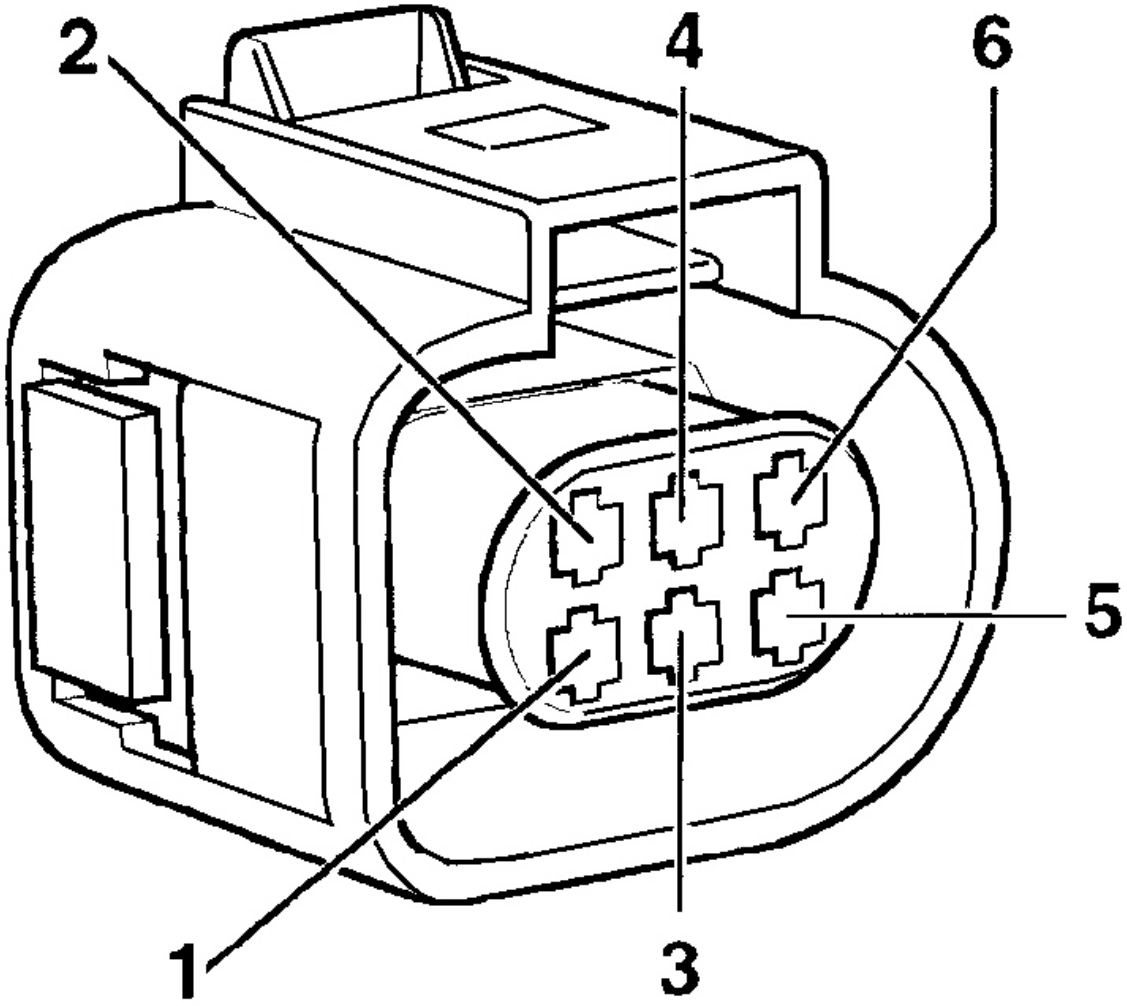
TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE**

RELEARN PROCEDURE .

9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073489

Fig. 33: Identifying Throttle Valve Control Module Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

DTC P0130/16514 & DTC P0135/16519

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0130/16514: HO2 Sensor (G39) Upstream TWC - Heating Circuit Malfunction
- DTC P0135/16519: HO2 Sensor (G39) Upstream TWC - Heating Element Circuit Malfunction

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 20** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 21** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 21** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7.

NOTE: Before replacing ECM check HO2S control signal. See DTC P0131/16515 & DTC P0132/16516 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.

Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 21** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0131/16515 & DTC P0132/16516

Code Definition

- DTC P0131/16515: HO2 Sensor (G39) Upstream TWC - Voltage Too Low
- DTC P0132/16516: HO2 Sensor (G39) Upstream TWC - Voltage Too High

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction, secondary air injection and exhaust system for leaks. Check air filter for blockage. If no air or exhaust leaks are found and air intake is unrestricted, go to next step. If air or exhaust leaks are found and/or air intake is restricted. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S G20 control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If HO2S heater is on, activation and readiness checks are okay. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .
3.

NOTE: Operating range of upstream HO2S is negative 25 to positive 25 percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to positive 10 percent specification is allowed to vary slightly.

Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay and show a lean signal, go to step 6 . If learned values are not okay and show a rich signal, go to step 7 .

4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no DTC resets test is complete.
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If downstream HO2S is okay, go to next step. If downstream HO2S is not okay, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve is not okay, repair as necessary. See **DTC P0440/16824 & DTC P0441/16825** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10.

NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.

Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC

memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

11. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 21** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.
13. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0133/16517 & DTC P0134/16518

Code Definition

- DTC P0133/16517: HO2 Sensor (G39) Upstream TWC - Signal Too Slow (Aging)
- DTC P0134/16518: HO2 Sensor (G39) Upstream TWC - No Activity (Aging)

NOTE: This procedure applies to engine codes AWV and AWM only.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. Using generic scan tool, following scan tool manufacturer's instructions, check aging of upstream HO2S.
4.

NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to switch from "Test off" to "Test on".

NOTE: For engine code AWM, go to step 5 .

Engine Code AWV - This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 34". Using accelerator pedal prop manually set engine speed to 1800-2200 RPM. Maintain engine speed of 1800 to 2200 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 1800 to 2200 RPM until scan tool displays specification "B1-S1 OK". If scan tool does not display "B1-S1 OK", go to step 6 . If scan tool displays "B1-S1 OK", erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. **Engine Code AWM -** This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "system in basic setting 34". Using accelerator pedal prop manually set engine speed to 2300-2500 RPM. Maintain engine speed of 2300 to 2500 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 2300 to 2500 RPM until scan tool displays specification "B1-S1 OK". If scan tool does not display "B1-S1 OK", go to next step. If scan tool displays "B1-S1 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0133/16517 & DTC P0134/16518

Code Definition

- DTC P0133/16517: HO2 Sensor (G39) Upstream TWC - Signal Too Slow (Aging)
- DTC P0134/16518: HO2 Sensor (G39) Upstream TWC - No Activity (Aging)

NOTE: This procedure applies to engine code AWP only.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. **NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to switch from "Test off" to "Test on".**

   Using generic scan tool, following scan tool manufacturer's instructions, check aging of upstream HO2S. Using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 34". Depress brake pedal and hold. Press accelerator pedal to wide open throttle position. Engine speed is increased by ECM 1800 to 2200 RPM. Maintain engine speed of 1800 to 2200 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 1800 to 2200 RPM until scan tool displays specification "B1-S1 OK". If scan tool does not display "B1-S1 OK", go to next step. If scan tool displays "B1-S1 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522

Code Definition

- DTC P0136/16520: HO2 Sensor (G130) Downstream TWC - Circuit Malfunction
- DTC P0137/16521: HO2 Sensor (G130) Downstream TWC - Voltage Too Low
- DTC P0138/16522: HO2 Sensor (G130) Downstream TWC - Voltage Too High

NOTE: If no fault is found when using this Test Procedure for DTC 0138/16522, check downstream HO2S (G130) heater. See DTC P0141/16525: HO2 SENSOR (G130) DOWNSTREAM TWC, HEATING ELEMENT CIRCUIT MALFUNCTION .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step.

If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) control signal activation. HO2S control signal should be activated. Use scan tool to check downstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in downstream HO2S heater activation test mode. Heater should be on. If HO2S heater is on, activation and readiness checks are okay. Go to next step, (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0141/16525: HO2 SENSOR (G130) DOWNSTREAM TWC, HEATING ELEMENT CIRCUIT MALFUNCTION** .
3. **NOTE: Downstream HO2S (G130) control signal activation may only occur above 1500 RPM.**

   NOTE: Downstream HO2S voltage does not fluctuate in the same manner as upstream HO2S. Downstream HO2S voltage may vary in very small increments, approximately 0.1 volt or less (e.g. 0.6 to 0.7 volt), within a specification range of 0.1 to 0.9 volt. When engine, HO2Ss and catalytic converter are in good working order, downstream HO2S voltage may not switch at all in a defined RPM range (e.g. 1500 RPM). See Fig. 34 .

   Using scan tool, check downstream HO2S control signal switching voltage. Downstream HO2S voltage should vary in very small increments, approximately 0.1 volt or less (e.g. 0.6 to 0.7 volt within specification range of 0.1 to 0.9 volt). If downstream HO2S voltage remains constant at any of the voltages identified in **DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE** table, go to step 5 . If HO2S does not remain constant at any of the voltages identified in **DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE** table, go to next step. If downstream HO2S voltage is okay (voltage is fairly constant, but does not match voltages identified in **DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE** table), test is complete. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DOWNSTREAM HO2S CONTROL SIGNAL SWITCHING VOLTAGE (1)

Downstream HO2S Voltage	Possible Fault
0.0	Possible Short To Ground
1.1	Possible Short To B+
0.4-0.5	Possible Open Circuit (ECM Supplied Basic Voltage)

(1) Voltages identified in this table indicate a fault with downstream HO2S switching voltage.

4. Test drive vehicle (to burn HO2S clean) and retest system. If test voltage is okay after test drive, go to next step. If test voltage is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors

protective cover and disconnect downstream HO2S (G130) harness connector (brown 4-pin), see **Fig. 19** . Go to next step.

6. Turn ignition off. Connect DVOM between terminals No. 3 and 4 of downstream HO2S harness connector, see **Fig. 23** . Start engine, check ECM supplied basic voltage. Turn ignition off. Voltage should be 0.4 to 0.5 volt. If voltage is not okay, go to next step. If voltage is okay, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following downstream HO2S harness connector terminals and test box sockets. See **Fig. 23** .
   - Downstream HO2S connector terminal No. 3 and test box socket No. 68.
   - Downstream HO2S connector terminal No. 4 and test box socket No. 69.
8. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in downstream HO2S 4-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

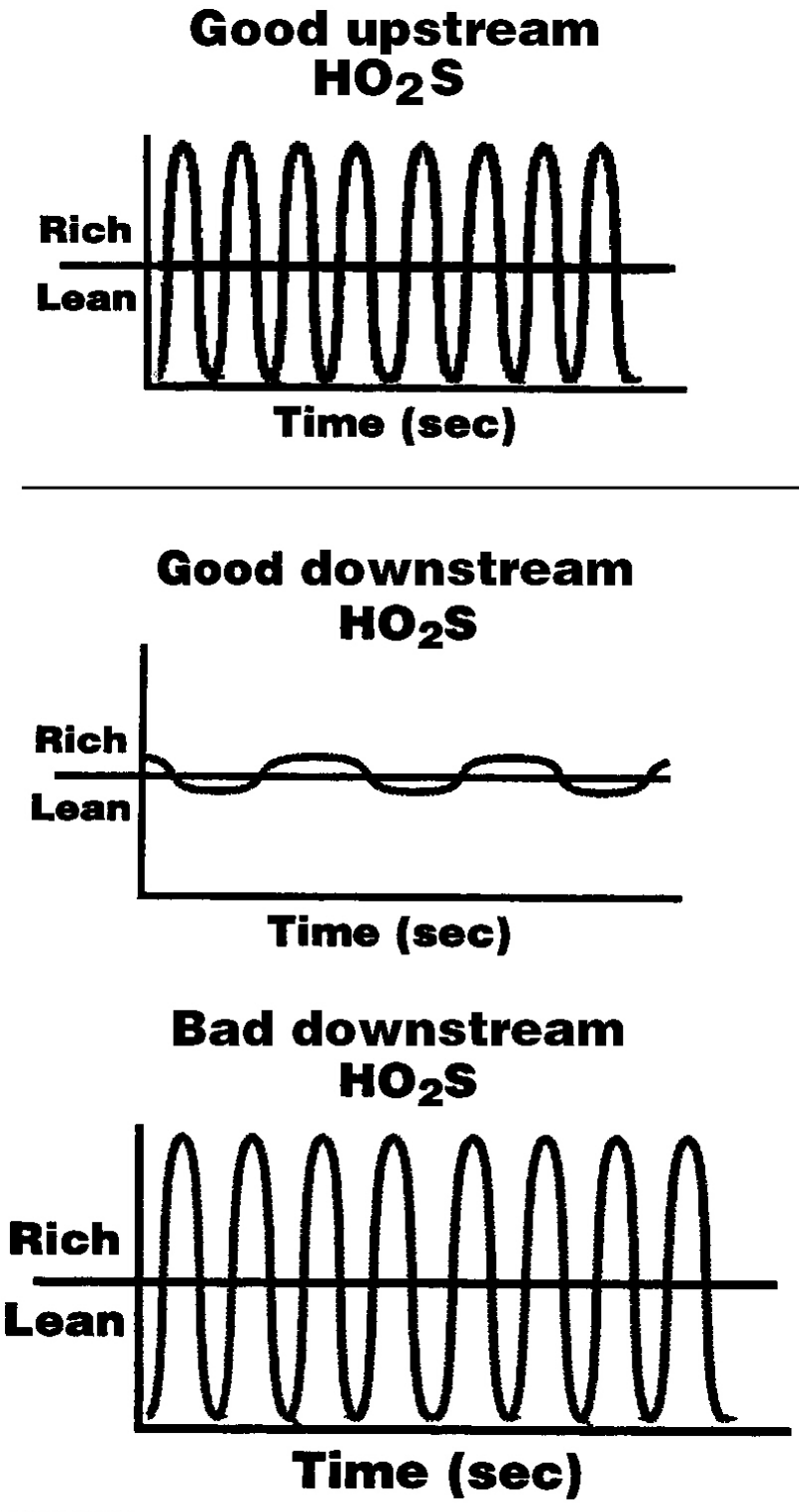


Fig. 34: Identifying HO2S Patterns
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0139/16523: HO2 SENSOR (G130) DOWNSTREAM TWC - SIGNAL TOO SLOW (AGING)

NOTE: This procedure applies to engine code AWV and AWM only.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. Using generic scan tool, following scan tool manufacturer's instructions, check aging of downstream HO2S.
4. **NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to switch from "Test off" to "Test on".**

   NOTE: For engine code AWM go to step 5

   Engine Code AWV - This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 43". Using accelerator pedal prop manually set engine speed to 1800-2200 RPM. Maintain engine speed of 1800 to 2200 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 1800 to 2200 RPM until scan tool displays specification "B1-P1 OK" or "B1-S2 OK". If scan tool does not display "B1-P1 OK" or "B1-S2 OK", go to step 6 . If scan tool displays "B1-P1 OK" or "B1-S2 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. **Engine Code AWM -** This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 43". Using accelerator pedal prop manually set engine speed to 2300-2500 RPM. Maintain engine speed of 2300 to 2500 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 2300 to 2500 RPM until scan tool displays specification "B1-S2 OK". If scan tool does not display "B1-S2 OK", go to next step. If scan tool displays "B1-S2 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0139/16523: HO2 SENSOR (G130) DOWNSTREAM TWC - SIGNAL TOO SLOW (AGING)

NOTE: This procedure applies to engine code AWP only.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. Using generic scan tool, following scan tool manufacturer's instructions, check aging of downstream HO2S.
4. **NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to switch from "Test off" to "Test on".**

   This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 43". Depress brake pedal and hold. Press accelerator pedal to wide open throttle position. Engine speed is increased by ECM 1800 to 2200 RPM. Maintain engine speed of 1800 to 2200 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 1800 to 2200 RPM until scan tool displays specification "B1-S2 OK". If scan tool does not display "B1-S2 OK", go to next step. If scan tool displays "B1-S2 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0140/16524: HO2 SENSOR (G130) DOWNSTREAM TWC - NO ACTIVITY (OPERATIONAL READINESS)

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using generic scan tool, following scan tool manufacturer's instructions, check aging of downstream HO2S.
3. **NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to switch from "Test off" to "Test on".**

   This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 36". Allow engine to run at idle until scan tool display jumps from "Test off" to "Test on". Observe downstream HO2S voltage on scan tool display, voltage should increase. Allow engine to continue idling until scan tool displays specification "B1-S2 OK". If scan tool does not display "B1-S2 OK", go to next step. If scan tool displays "B1-S2 OK", erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, ECM supplied basic voltage needs to be checked. Go to next step.
5. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (brown 4-pin), see **Fig. 19** . Go to next step.
6. Turn ignition off. Connect DVOM between terminals No. 3 and 4 of downstream HO2S harness connector, see **Fig. 23** . Start engine, check ECM supplied basic voltage. Turn ignition off. Voltage should be 0.4 to 0.5 volt. If voltage is not okay, go to next step. If voltage is okay, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following downstream HO2S harness connector terminals and test box sockets. See **Fig. 23** .
   - Downstream HO2S connector terminal No. 3 and test box socket No. 68.
   - Downstream HO2S connector terminal No. 4 and test box socket No. 69.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in downstream HO2S 4-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0141/16525: HO2 SENSOR (G130) DOWNSTREAM TWC - HEATING ELEMENT CIRCUIT MALFUNCTION

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (brown 4-pin), see **Fig. 19** . Go to next step.
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 22** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 23** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 23** . Reconnect scan tool (if

removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 23** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0170/16554, DTC P0171/16555 & DTC P0172/16556

Code Definition

- DTC P0170/16554: Fuel Trim - System Malfunction
- DTC P0171/16555: Fuel Trim - Too Lean
- DTC P0172/16556: Fuel Trim - Too Rich

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction, secondary air injection and exhaust system for leaks. Check air filter for blockage. If no air or exhaust leaks are found and air intake is unrestricted, go to next step. If air or exhaust leaks are found and/or air intake is restricted. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2.

NOTE: Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S G20 control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If HO2S heater is on, activation and readiness checks are okay. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .

3. **NOTE: Operating range of upstream HO2S is negative 25 to positive 25 percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to positive 10 percent specification is allowed to vary slightly.**

   Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay and show a lean signal, go to step 6 . If learned values are not okay and show a rich signal, go to step 7 .
4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no DTC resets test is complete.
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If downstream HO2S is okay, go to next step. If downstream HO2S is not okay, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE**

RELEARN PROCEDURE .

9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve is not okay, repair as necessary. See **DTC P0440/16824 & DTC P0441/16825** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. **NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.**

    Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
11. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 21** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.

    Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0197/16581 & DTC P0198/16582 (PASSAT)

Code Definition

- DTC P0197/16581: Engine Oil Temperature Sensor (G266) - Signal Too Low
- DTC P0198/16582: Engine Oil Temperature Sensor (G266) - Signal Too High

NOTE: DTC P0197/16581 and P0198/16582 are for Passat only.

Test Requirements

Ensure oil level is correct. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is

okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Oil Temperature Sensor is located at bottom of engine oil pan.

1. Check wiring between Oil Temperature Sensor (G266) and Instrument Cluster Control Module (J285), for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace faulty Oil Level Sensor (G266). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0201/16585, DTC P0202/16586, DTC P0203/16587 & DTC P0204/16588

Code Definition

- DTC P0201/16585: Injector Cylinder 1 (N30) - Electrical Circuit Malfunction
- DTC P0202/16586: Injector Cylinder 2 (N31) - Electrical Circuit Malfunction
- DTC P0203/16587: Injector Cylinder 3 (N32) - Electrical Circuit Malfunction
- DTC P0204/16588: Injector Cylinder 4 (N33) - Electrical Circuit Malfunction

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary. Beetle (engine code AWV) does not have an Output Diagnostic Test Mode for activating fuel injectors.

1. For Beetle (engine code AWV), go to next step. For all models except Beetle (engine code AWV). Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should

audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .

2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 35** . Resistance must be 12-17 ohms at room temperature, (resistance should be greater than 12-17 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 36** and **Fig. 17** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector harness connector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .
4. Check resistance between fuel injector harness connector terminal No. 1 that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary.
5. **NOTE: Test light may not go out completely, but should dull and get brighter during activation.**

   With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 36** and **Fig. 17** .

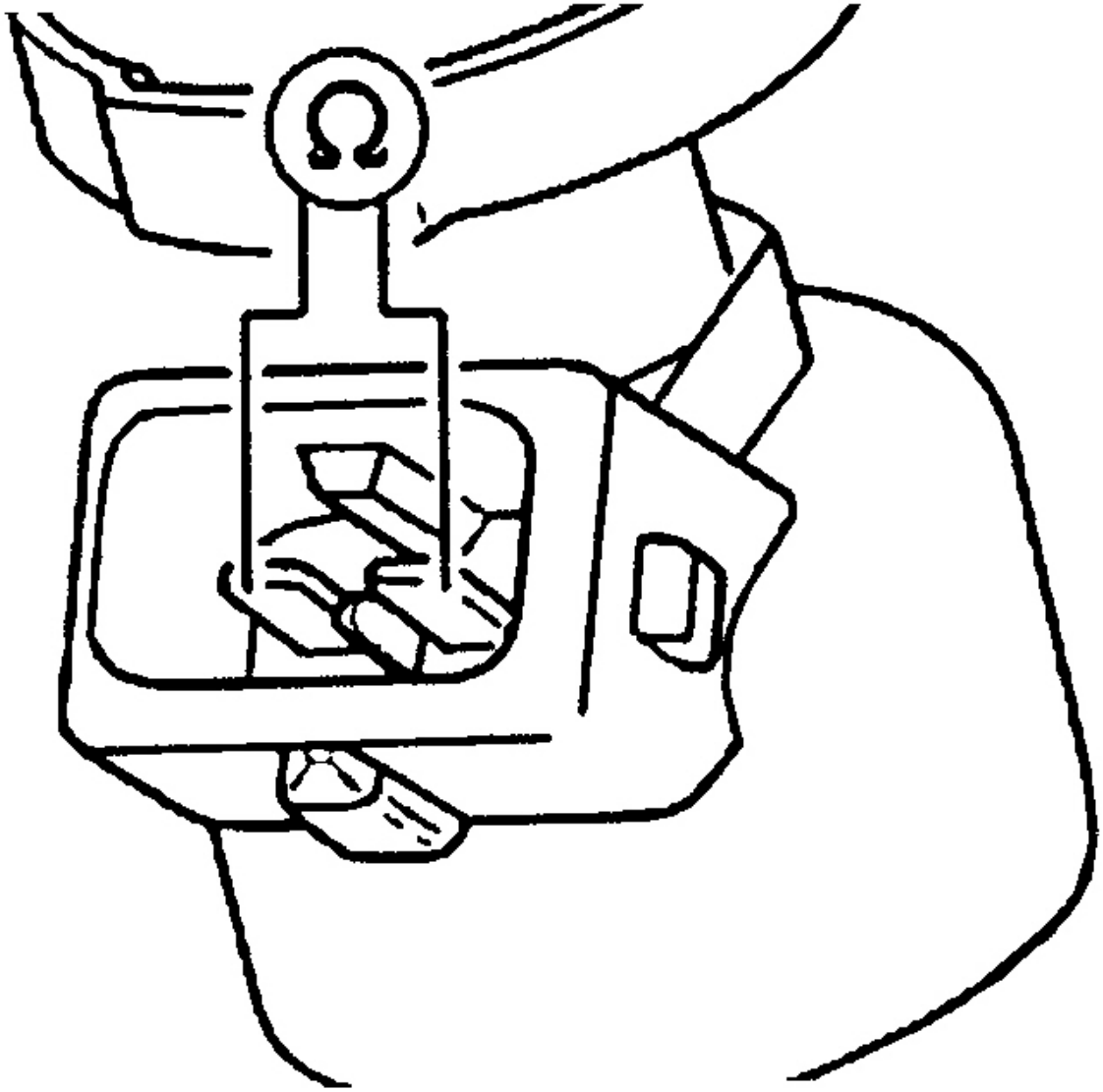
FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness

connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. See **ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083391

Fig. 35: Identifying Fuel Injector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

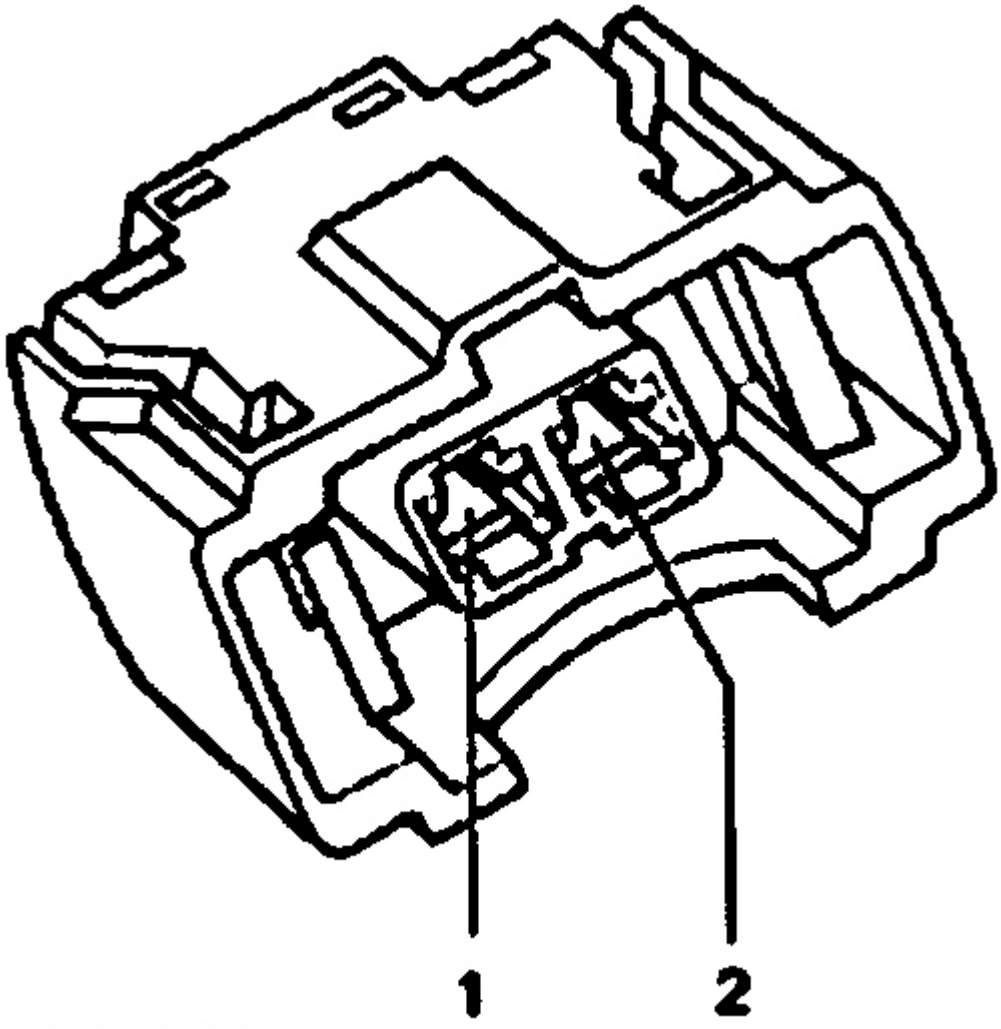


Fig. 36: Identifying Fuel Injector Harness Connector Terminals (Beetle, GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0219/16603: MAXIMUM ENGINE RPM EXCEEDED

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Check and record DTCs. Erase DTCs. Repair mechanical damage.

DTC P0221/16605, DTC P0222/16606 & DTC P0223/16607

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P0221/16605: Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal
- DTC P0222/16606: Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
- DTC P0223/16607: Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-93 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: **Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.**

1. **NOTE:** **If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217),

see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check accelerator pedal position sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If accelerator pedal position sensors are not okay, go to next step. If accelerator pedal position sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
5. Replace accelerator pedal position sensors as necessary. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt accelerator pedal position sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118
6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC

memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185) - IMPLAUSIBLE SIGNAL

Circuit/Component Description

Accelerator Pedal Position (APP) sensor No. 1 (G79) and APP sensor No. 2 (G185) are located together as one unit in pedal assembly. APP sensors sense the position of the accelerator pedal, not throttle position.

When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) communicate driver's intentions to ECM, fully independent of each other. APP sensor No. 1 (G79) and APP sensor No. 2 (G185). On all models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat, specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts), the larger the throttle opening the higher the percentage (voltage) reading. For all models, APP Sensor No. 2 (G185) ranges from 3-48 percent (0.15 to 2.40 volts), the larger the throttle opening the higher the percentage (voltage) reading.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for accelerator position sensors may not fully display on scan tool.

Percentage (voltage) should always be twice as large for APP sensor No. 1 (G79) as the percentage (voltage) for APP sensor No. 2 (G185). No idle specifications for APP sensors are given by manufacturer.

1. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading on APP sensors No. 1 (G79) and No. 2 (G185).
2. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for APP sensor No. 1 (G79) and APP sensor No. 2 (G185). All models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat, Specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts). All models, specification for APP sensor No. 2 (G185) is 3 to 48 percent (0.15 to 2.40 volts). If percentage (voltage) is not okay, go to next step. If percentage (voltage) is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Remove drive's side footwell cover and trim as necessary. Disconnect APP sensors 6-pin harness connector. Turn ignition on. Check voltage supply at 6-pin harness connector. See **Fig. 37** . See **CHECKING ACCELERATOR PEDAL POSITION (APP) SENSOR CIRCUITS** table. Turn ignition off. If no voltage is present, go to next step. If voltage tests are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR VOLTAGE SPECIFICATIONS

APP Sensor Harness Connector Terminals	Voltage
1 & Ground	Minimum 4.5
1 & 5	Minimum 4.5
2 & Ground	Minimum 4.5
2 & 3	Minimum 4.5

4. **NOTE: If accelerator pedal assembly is replaced, APP sensors must be adapted to the A/T control module.**

   Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) or (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between APP sensor circuits and test box sockets. See **APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in APP sensor 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

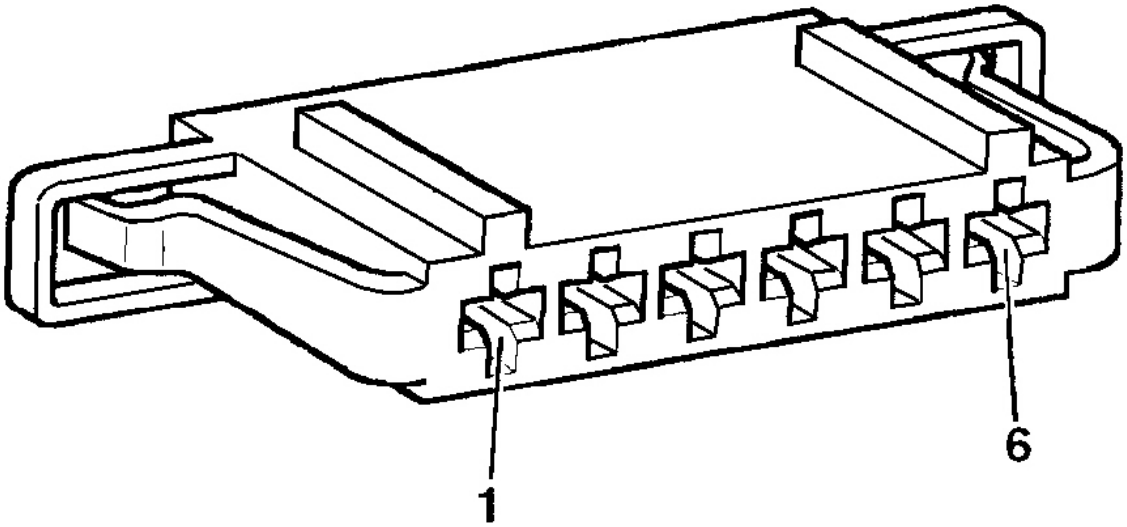
APP Sensor 6-Pin Harness Connector Terminal	VAG Test Box Socket

1	72
2	73
3	36
4	35
5	33
6	34

5.

NOTE: APP sensor harness connector terminal No. 5 is for A/T models only.

Replace faulty APP sensors No. 1 (G79) and No. 2 (G185). Accelerator position sensors are an integral part of the accelerator pedal assembly. After repairs, erase DTC memory. Adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073493

Fig. 37: Identifying Accelerator Pedal Position (APP) Sensor Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

DTC P0230/16614: FUEL PUMP RELAY (J17) - ELECTRICAL CIRCUIT MALFUNCTION

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Using DVOM, check power supply and ground to Fuel Pump Relay. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Check resistance of Fuel

Pump Relay wiring. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check Fuel Pump Relay wiring for short circuits to one another, and for short circuits to B+ and ground. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If resistance, voltage and ground supply are okay and no short circuits are present, replace faulty Fuel Pump Relay (J17). If resistance and/or voltage or ground supply are not okay or a short circuit is present, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

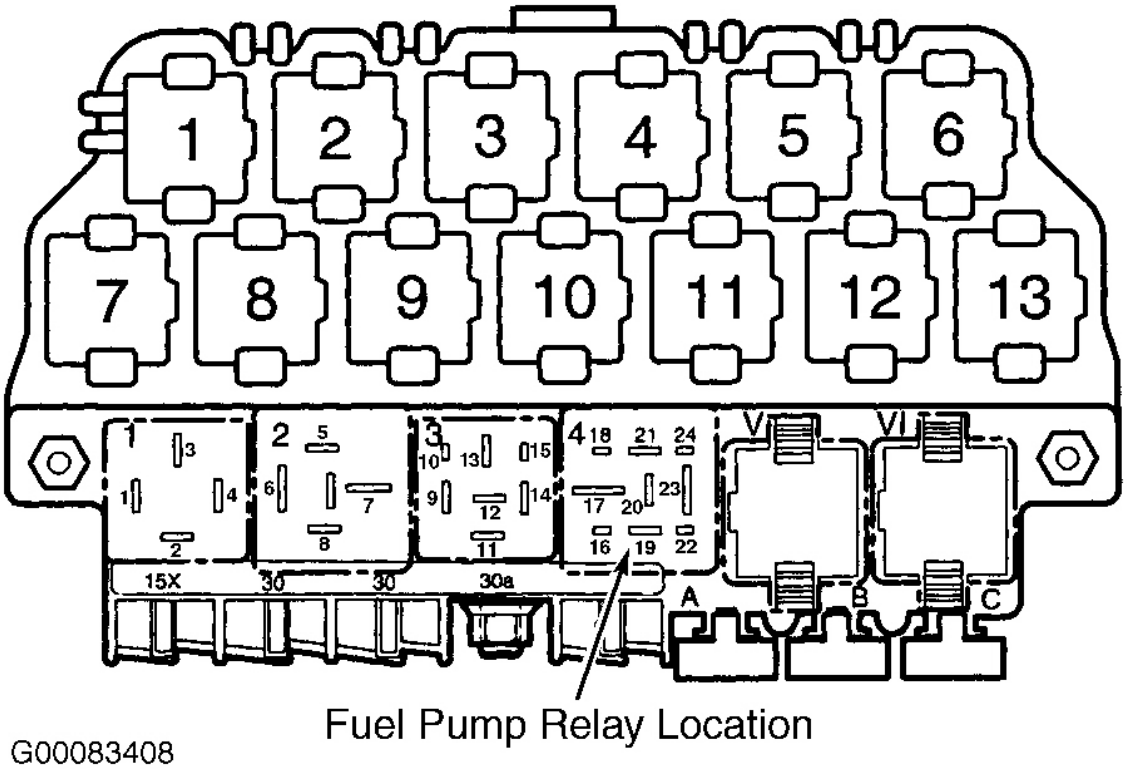


Fig. 38: Fuel Pump Relay Location (All Models)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0234/16618, DTC P0235/16619 & DTC P0236/16620

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definitions

- DTC P0234/16618: Charge Pressure Regulation - Control Limit Exceeded
- DTC P0235/16619: Charge Pressure Regulation - Control Limit Not Achieved
- DTC P0236/16620: Charge Air Pressure Sensor (G31) - Implausible Signal

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure - Charge Air Pressure Sensor

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Go to next step.
2. Disconnect Charge Air Pressure sensor 4-pin harness connector. See **COMPONENT LOCATIONS** . Turn ignition on. Using DVOM measure voltage between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector. See **Fig. 25** . Voltage should be a minimum of 4.5 volts. Turn ignition off. If readings are okay, go to next step (additional testing is needed). If readings are not okay, go to next step.
3. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following Charge Air Pressure sensor harness connector terminals and test box sockets. See **Fig. 25** .
   - Charge Air Pressure sensor harness connector terminal No. 1 and test box socket No. 108.
   - Charge Air Pressure sensor harness connector terminal No. 3 and test box socket No. 98.
   - Charge Air Pressure sensor harness connector terminal No. 4 and test box socket No. 101.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in Charge Air Pressure sensor harness connector 4-pin connector for short circuits to one another. Go to next step.
4. If Charge Air Pressure sensor harness connector circuits are okay and 4.5 volts minimum is present between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector, go to next step. If Charge Air Pressure sensor harness connector circuits are okay, but no voltage is present between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Leave ECM harness connected to Test Box (VAG 1598/31) and connect ECM to Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Start engine and idle. Using DVOM, check voltage between test box sockets No. 101 and 108. For all models except Beetle (engine code AWV) voltage should be 1.8-2.0 volts at idle. For Beetle (engine code AWV) voltage should be 0.4-0.5 volts at idle. Observe DVOM and briefly accelerate from idle to wide open throttle. For all models, voltage reading should be 2.0-3.0 volts. If voltage readings are okay, Charge Air Pressure sensor is okay. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If voltage readings are not okay, replace faulty Charge Air Pressure sensor. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0237/16621 & DTC P0238/16622

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in

SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0237/16621: Charge Air Pressure Sensor (G31) - Signal Too Low
- DTC P0238/16622: Charge Air Pressure Sensor (G31) - Signal Too High

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure - Charge Air Pressure Sensor

1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Go to next step.
2. Disconnect Charge Air Pressure sensor 4-pin harness connector. See **COMPONENT LOCATIONS** . Using DVOM measure voltage between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector. See **Fig. 25** . Voltage should be a minimum of 4.5 volts. Turn ignition off. If readings are okay, go to next step. If readings are not okay, go to next step.
3. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following Charge Air Pressure sensor harness connector terminals and test box sockets. See **Fig. 25** .
   - Charge Air Pressure sensor harness connector terminal No. 1 and test box socket No. 108.
   - Charge Air Pressure sensor harness connector terminal No. 3 and test box socket No. 98.
   - Charge Air Pressure sensor harness connector terminal No. 4 and test box socket No. 101.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in Charge Air Pressure sensor harness connector 4-pin connector for short circuits to one another. Go to next step.
4. If Charge Air Pressure sensor harness connector circuits are okay and 4.5 volts minimum is present between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector, go to next step. If Charge Air Pressure sensor harness connector circuits are okay, but no voltage is present between terminals No. 1 and 3 of Charge Air Pressure sensor 4-pin harness connector, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Leave ECM harness connected to Test Box (VAG 1598/31) and connect ECM to Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Start engine and idle. Using DVOM, check voltage between test box sockets No. 101 and 108. For all models except Beetle (engine code AWV) voltage should be 1.8-2.0 volts at idle. For Beetle (engine code AWV) voltage should be 0.4-0.5 volts at idle. Observe DVOM and briefly accelerate from idle to wide open throttle. For all models, voltage reading should be 2.0-3.0 volts. If voltage readings are okay, Charge Air Pressure sensor is okay. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If voltage readings are not okay, replace faulty Charge Air Pressure sensor. Erase DTC

memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0243/16627, DTC P0245/16629 & DTC P0246/16630

Code Definition

- DTC P0243/16627: Wastegate By-Pass Regulator Valve (N75) - Open/Short To Ground
- DTC P0245/16629: Wastegate By-Pass Regulator Valve (N75) - Short To Ground
- DTC P0246/16630: Wastegate By-Pass Regulator Valve (N75) - Short To B+

NOTE: When using scan tool to activate wastegate by-pass regulator valve, it is barely audible, check by touch or use mechanics stethoscope if necessary.

Test Requirements

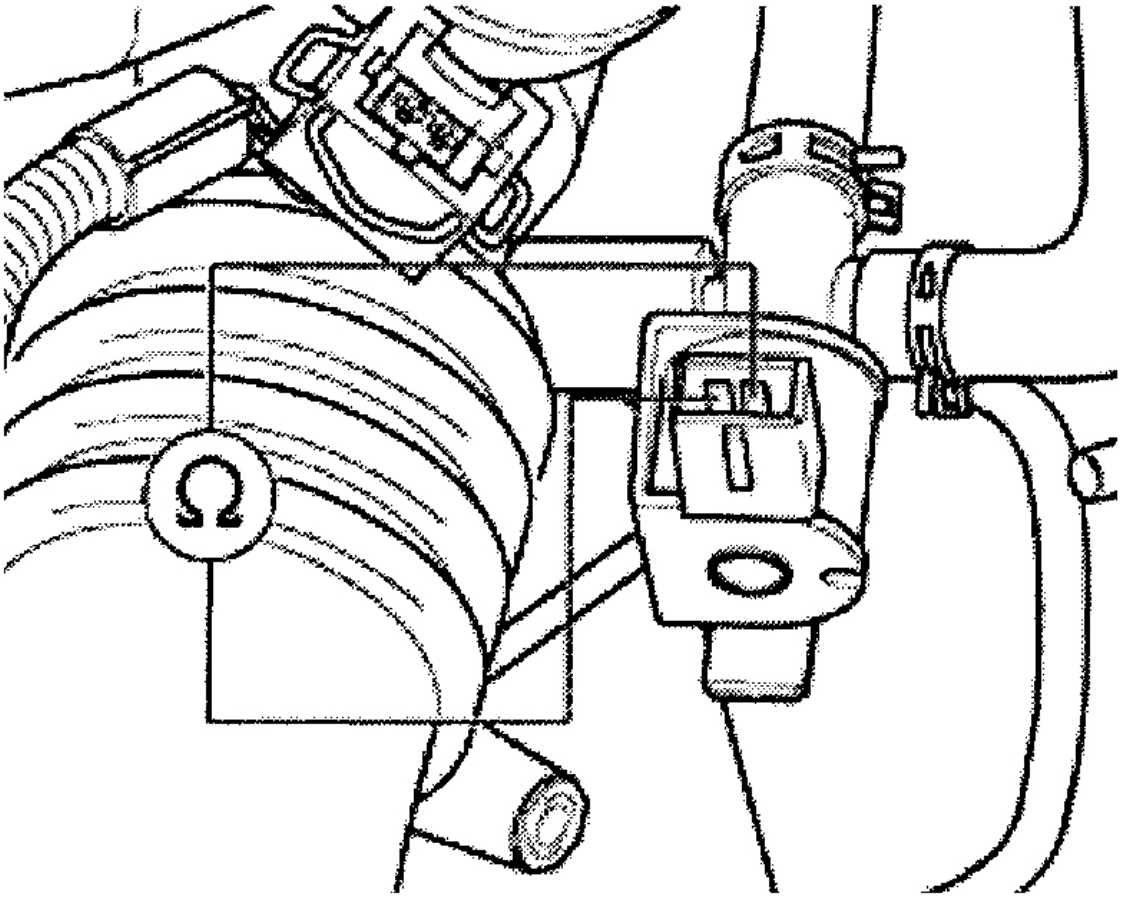
Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Turn ignition off. Locate wastegate by-pass regulator valve. See **COMPONENT LOCATIONS** . Check hoses to wastegate by-pass regulator valve (N75). If hoses are okay, go to next step. If hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Disconnect wastegate by-pass regulator valve harness connector. Measure resistance between valve terminals. See **Fig. 39** or **Fig. 40** . If resistance is between 25-35 ohms, go to next step. If resistance is not 25-35 ohms, replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Connect Scan Tool. Turn ignition on, engine off. Using scan tool, activate wastegate by-pass regulator valve. Wastegate by-pass regulator valve should audibly click. If wastegate by-pass regulator valve does not click, go to next step. If wastegate by-pass regulator valve clicks. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Disconnect wastegate by-pass regulator valve harness connector. See **COMPONENT LOCATIONS** e. Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to wastegate by-pass regulator valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of wastegate by-pass regulator valve. Turn ignition off. Replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, measure resistance between wastegate by-pass regulator valve harness connector terminal No. 2 and test box socket No. 104. See . Record resistance reading. Resistance should be a maximum of 1.5

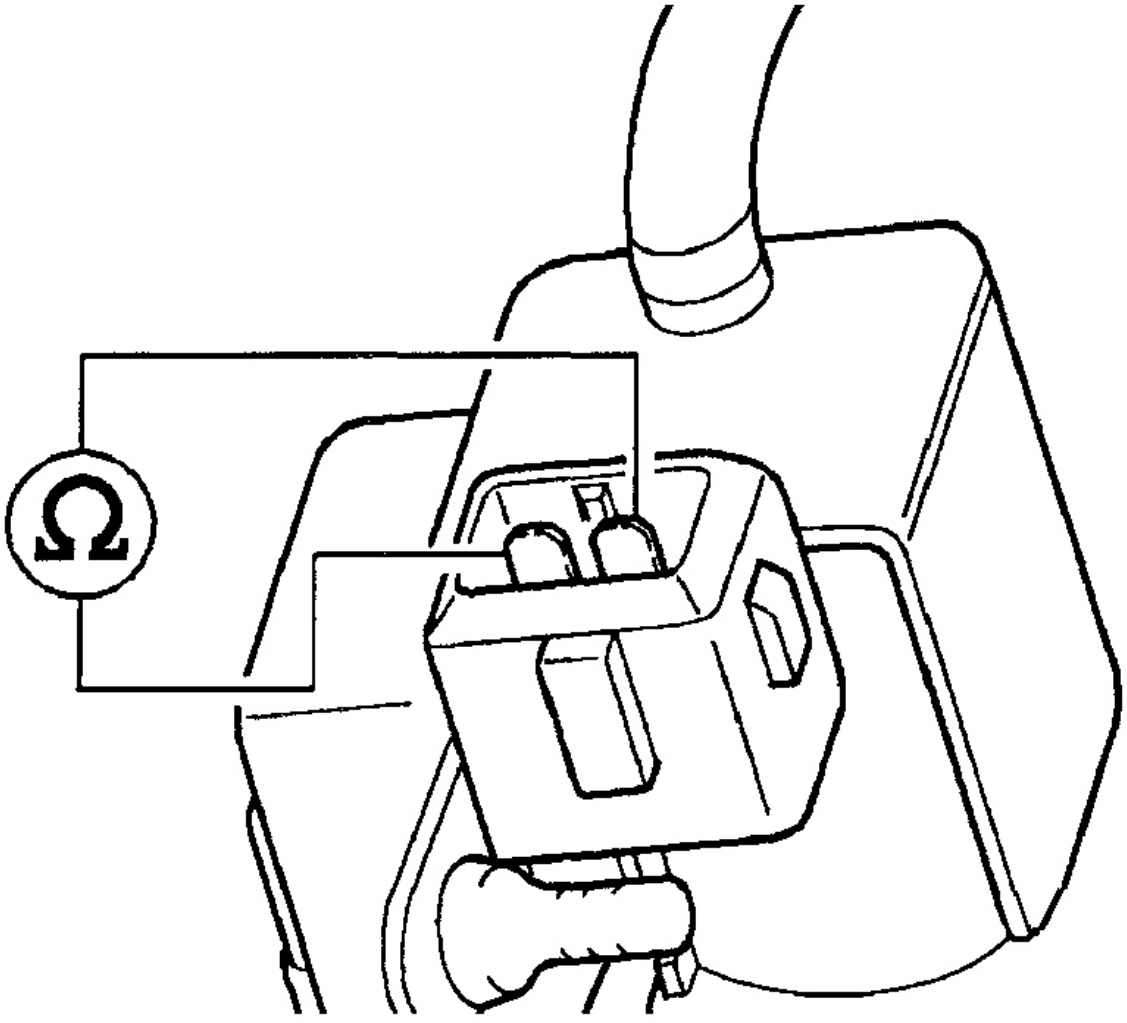
ohms. Check terminal No. 2 of wastegate by-pass regulator valve harness connector for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Using DVOM, check resistance between wastegate by-pass regulator valve harness connector terminal No. 1 and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. Verify repair. Test is complete. If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00064776

Fig. 39: Identifying Test Points On Wastegate By-Pass Valve (N75 - Beetle, GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00064777

Fig. 40: Identifying Test Points On Wastegate By-pass Valve (N75 - Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0261/16645, DTC P0262/16646, DTC P0264/16648 & DTC P0265/16649

Code Definition

- DTC P0261/16645: Injector Cylinder 1 (N30) - Short To Ground
- DTC P0262/16646: Injector Cylinder 1 (N30) - Short To B+
- DTC P0264/16648: Injector Cylinder 2 (N31) - Short To Ground
- DTC P0265/16649: Injector Cylinder 2 (N31) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system

leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary. Beetle (engine code AWV) does not have an Output Diagnostic Test Mode for activating fuel injectors.

1. For Beetle (engine code AWV), go to next step. For all models except Beetle (engine code AWV). Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 35** . Resistance must be 12-17 ohms at room temperature, (resistance should be greater than 12-17 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 36** and **Fig. 17** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .
4. Check resistance between fuel injector harness connector terminal No. 1 that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary.
5. **NOTE: Test light may not go out completely, but should dull and get brighter during activation.**

   With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector

harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .

6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 36** and **Fig. 17** .

FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0267/16651, DTC P0268/16652, DTC P0270/16654 & DTC P0271/16655

Code Definition

- DTC P0267/16651: Injector Cylinder 3 (N32) - Short To Ground
- DTC P0268/16652: Injector Cylinder 3 (N32) - Short To B+
- DTC P0270/16654: Injector Cylinder 4 (N33) - Short To Ground
- DTC P0271/16655: Injector Cylinder 4 (N33) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary. Beetle (engine code AWV) does not have an Output Diagnostic Test Mode for activating fuel injectors.

1. For Beetle (engine code AWV), go to next step. For all models except Beetle (engine code AWV). Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 35** . Resistance must be 12-17 ohms at room temperature, (resistance should be greater than 12-17 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 36** and **Fig. 17** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .
4. Check resistance between fuel injector harness connector terminal No. 1 that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM

WIRING DIAGRAMS. Repair as necessary.

5.

NOTE: Test light may not go out completely, but should dull and get brighter during activation.

With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .

6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 36** and **Fig. 17** .

FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0300/16684, DTC P0301/16685, DTC P0302/16686, DTC P0303/16687 & DTC P0304/16688

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P0300/16684: Misfire Recognized
- DTC P0301/16685: Misfire Cylinder 1
- DTC P0302/16686: Misfire Cylinder 2
- DTC P0303/16687: Misfire Cylinder 3
- DTC P0304/16688: Misfire Cylinder 4

Test Requirements

Ensure vehicle has a sufficient amount of fuel. Ensure Camshaft Position sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748** . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705 & DTC P0322/16706** . Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

CAUTION: When checking misfires, it is essential to ensure fuel is not contaminated and that engine is mechanically sound (e.g. compression is okay).

NOTE: **Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.**

1. Turn ignition off. Remove and check condition of spark plug at misfiring cylinder. Check spark plug for correct heat range. If spark plug(s) are okay, go to next step. If spark plug(s) are not okay, replace spark plugs as a set. See SPARK PLUGS in appropriate SERVICE & ADJUSTMENT SPECIFICATIONS article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Using scan tool, check fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . Fuel injectors should audibly click. If all fuel injectors click, go to next step. If any fuel injector does not click, repair as necessary. See **DTC P0201/16585, DTC P0202/16586, DTC P0203/16587 & DTC P0204/16588** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using DVOM, check voltage supply to ignition coil of cylinder indicated to be misfiring. Disconnect

ignition coil harness connector. Turn ignition on, engine off. Check voltage between harness connector terminals No.1 and 2. See **Fig. 41** . Check voltage between harness connector terminals No. 1 and 4, each voltage reading should be a minimum of 11.5 volts. Turn ignition off. If no voltage is present, go to next step. If voltage readings are okay, go to step 8 .

4. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 1 and power supply relay using wiring diagram. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 41** . Resistance reading should be a maximum of 1.5 ohms. If resistance reading is okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 2 and ground, and harness connector terminal No. 4 ground. See **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Cylinder	Ignition Coil Harness Connector Terminal	VAG Test Box Socket
1	3	102
2	3	95
3	3	103
4	3	94

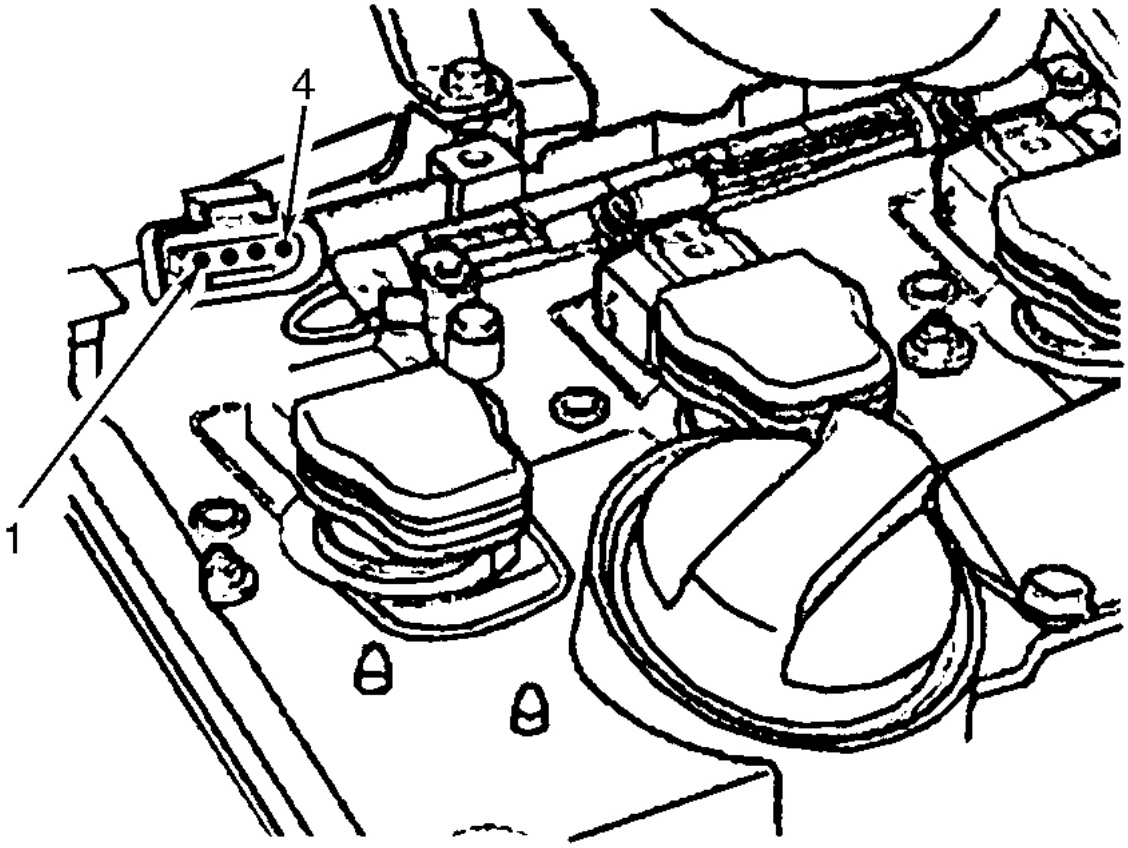
7. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8.

WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.

NOTE: Removing fuse No. 32 disables fuel injectors. Ignition coils and final output stages are one component and cannot be replaced individually.

Remove fuse No. 32. Disconnect ignition coil harness connector. Connect LED equipped test light to

ignition coil harness connector terminals No. 2 and 3 of cylinder(s) indicated to be misfiring. See **Fig. 41** . Turn ignition on, engine off. Using ignition switch, operate starter, LED must illuminate. If test light does not illuminate, go to step 6 . If test light illuminates, replace faulty ignition coil(s)/output stage(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083393

Fig. 41: Identifying Test Points On Ignition Coil/Output Stage Harness Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0318/16702: POOR ROAD INFORMATION FROM ABS CONTROL MODULE (J104) - ELECTRICAL CIRCUIT MALFUNCTION

NOTE: This code can be set while performing an emissions test where front wheels are rotated and rear wheels are stationary. Remove ABS control module fuse before performing this type of emissions test.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Check wiring between ABS control module and ECM for open or short. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check ABS system. See appropriate ABS article.

DTC P0321/16705 & DTC P0322/16706

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0321/16705: Engine Speed Sensor (RPM - G28), Implausible Signal
- DTC P0322/16706: Engine Speed Sensor (RPM - G28), No Signal

Test Requirement

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure - Beetle, GTI & Jetta

NOTE: Engine Speed (RPM) Sensor (G28) is a speed and reference sensor. If Engine Speed sensor does not send a signal, engine will not start. If Engine Speed sensor fails when engine is running, engine will stall.

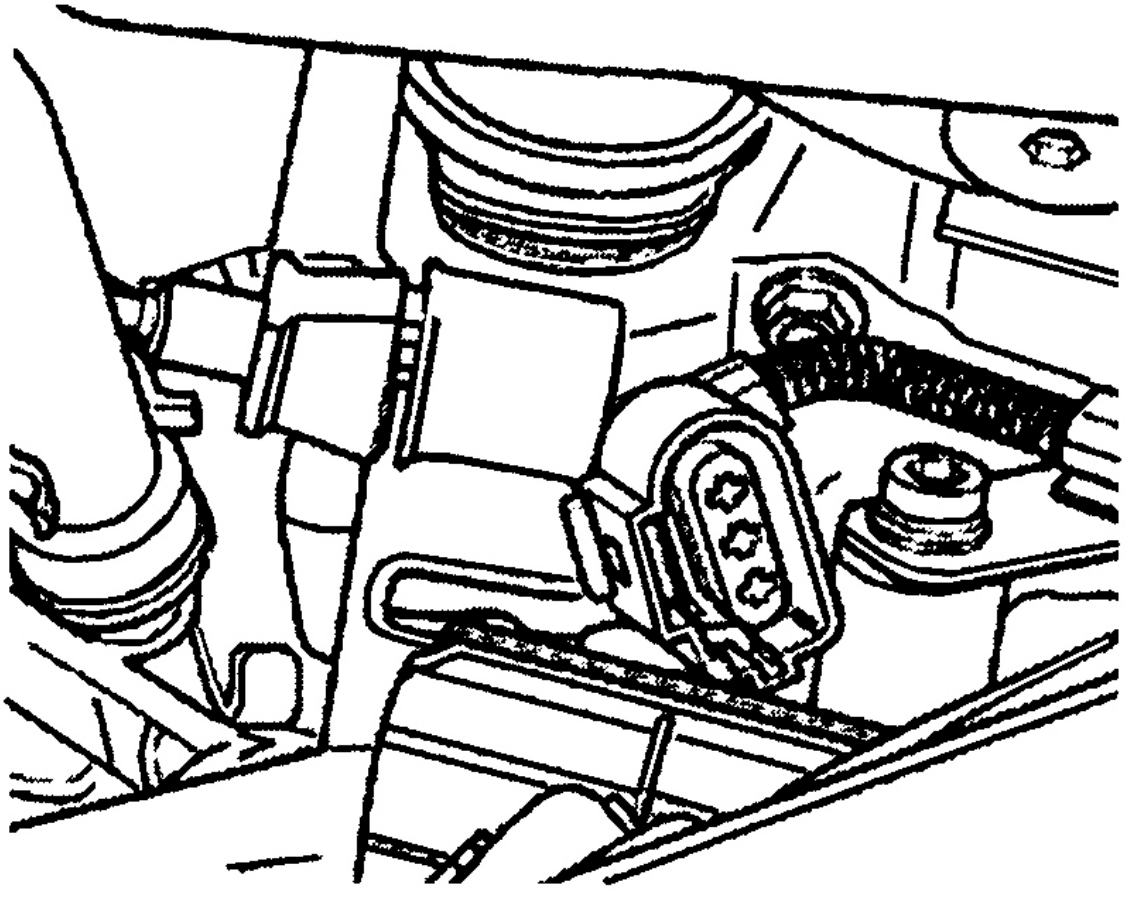
1. Disconnect grey 3-pin harness connector from Engine Speed Sensor (G28). For all engine codes except AWW and AWP. See **COMPONENT LOCATIONS** . For engine codes AWW and AWP, see **Fig. 42** . Using DVOM measure resistance between terminals No. 2 and 3 of Engine Speed sensor. See **Fig. 43** . Resistance should be 730-1000 ohms. Check for short circuit between Engine Speed sensor terminals No. 1 and 2. Check for short circuit between Engine Speed sensor terminals No. 1 and 3. If readings are okay, go to next step. If readings are not okay, replace faulty Engine Speed sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following Engine Speed sensor 3-pin harness connector terminals and test box sockets. See **Fig. 44** .
    - Engine Speed sensor 3-pin harness connector terminal No. 1 and test box socket No. 108.
    - Engine Speed sensor 3-pin harness connector terminal No. 2 and test box socket No. 90.
    - Engine Speed sensor 3-pin harness connector terminal No. 3 and test box socket No. 82.

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in Engine Speed sensor 3-pin harness connector for short circuits to one another. If resistance is okay and no short circuits are present, go to next step. If resistance is not okay or short circuit exists, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

3.

NOTE: There is a gap in sensor wheel. This gap is the reference mark.

Remove Engine Speed sensor. Ensure Engine Speed sensor wheel is secure on sensor shaft. Check Engine Speed sensor for excessive runout and damage. Repair or replace as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If Engine Speed sensor harness connector circuits are okay, and Engine Speed sensor is okay, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083368

Fig. 42: Locating Engine Speed Sensor (Beetle, GTI & Jetta - Engine Code AWP, GTI & Jetta Engine Code AWW)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

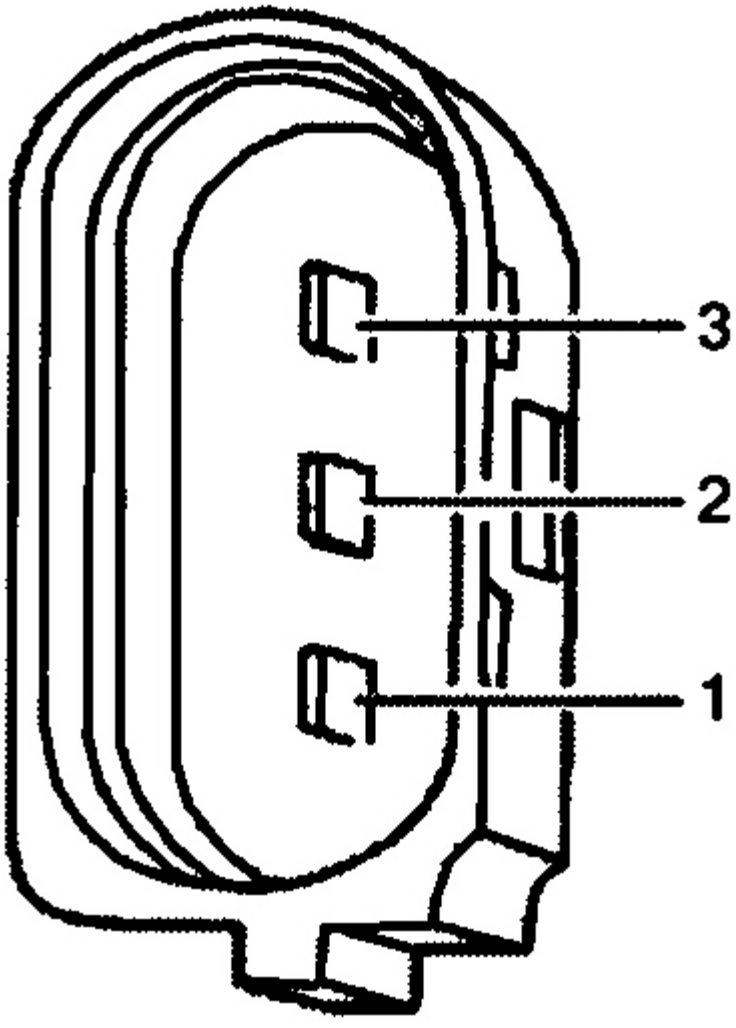


Fig. 43: Identifying Engine Speed Sensor Test Points (Late Model)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

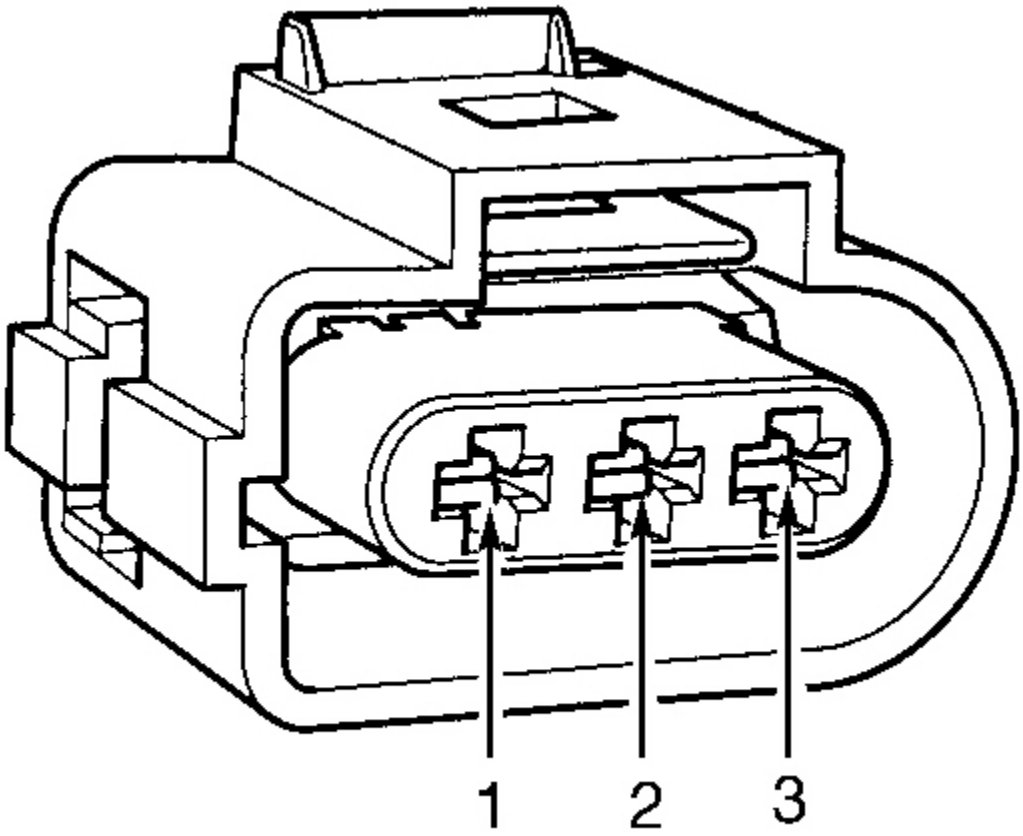


Fig. 44: Identifying Test Points On 3-Pin Connector (Late Model)
Courtesy of VOLKSWAGON UNITED STATES, INC.

Passat

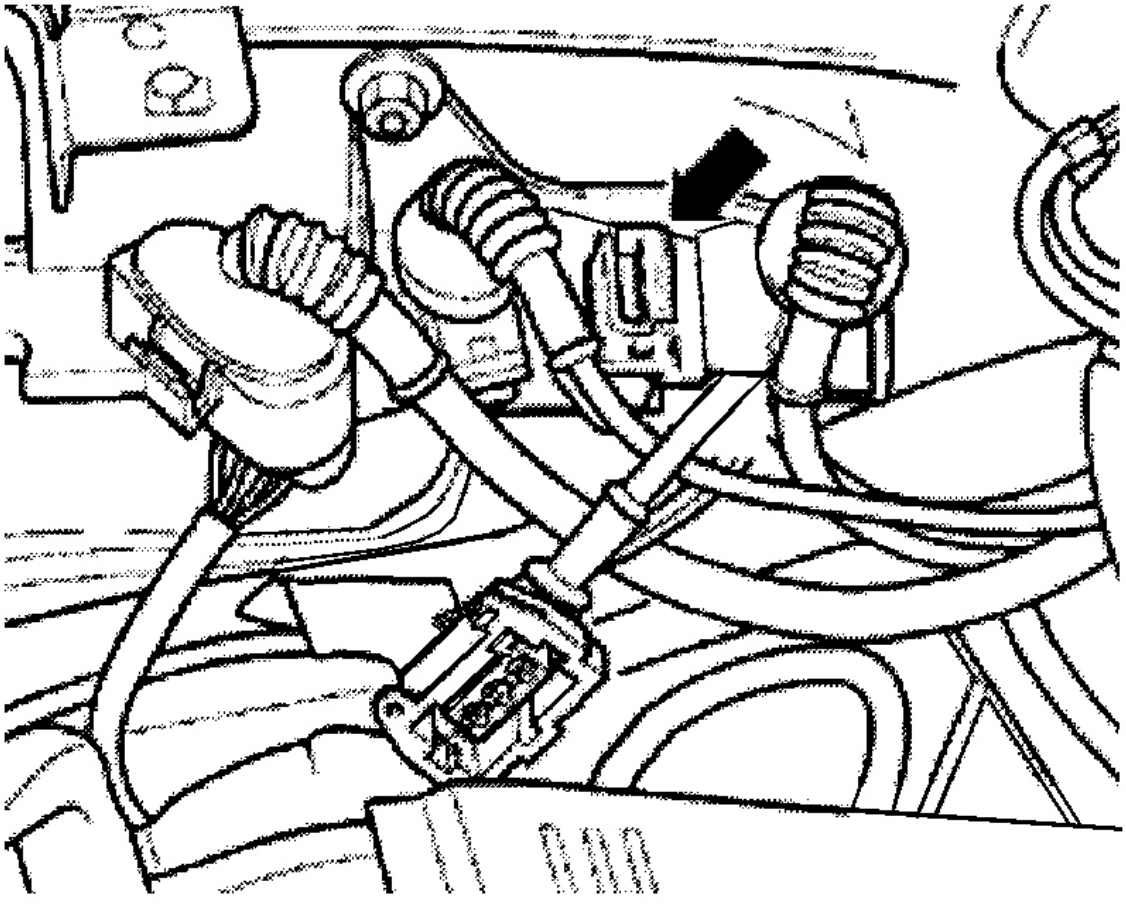
1. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Go to next step.
2. Disconnect grey 3-pin harness connector from Engine Speed sensor. See **Fig. 45** . Using DVOM measure resistance between terminals No. 2 and 3 of Engine Speed sensor. See **Fig. 43** . Resistance should be 400-1000 ohms. Check for short circuit between Engine Speed sensor terminals No. 1 and 2. Check for short circuit between Engine Speed sensor terminals No. 1 and 3. If readings are okay, go to step 3 . If readings are not okay, replace faulty Engine Speed sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following Engine Speed sensor 3-pin harness connector terminals and test box sockets. See **Fig. 44** .
    - Engine Speed sensor 3-pin harness connector terminal No. 1 and test box socket No. 108.
    - Engine Speed sensor 3-pin harness connector terminal No. 2 and test box socket No. 90.
    - Engine Speed sensor 3-pin harness connector terminal No. 3 and test box socket No. 82.

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in Engine Speed sensor 3-pin harness connector for short circuits to one another. If resistance is okay and no short circuits are present, go to next step. If resistance is not okay or short circuit exists, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4.

NOTE: There is a gap in sensor wheel. This gap is the reference mark.

Remove Engine Speed sensor. Ensure Engine Speed sensor wheel is secure on sensor shaft. Check Engine Speed sensor for excessive runout and damage. Ensure that spacer for sensor is seated securely. Repair or replace as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If Engine Speed sensor harness connector circuits are okay, and Engine Speed sensor is okay, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083373

Fig. 45: Locating Engine Speed Sensor (Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0324/16708, DTC P0327/16711, DTC P0328/16712, DTC P0332/16716 & DTC P0333/16717

NOTE: Following procedure applies to all models except Passat.

Code Definition

- DTC P0324/16708: Knock Control Malfunction
- DTC P0327/16711: Knock Sensor 1 (G61) - Signal Too Low
- DTC P0328/16712: Knock Sensor 1 (G61) - Signal Too High
- DTC P0332/16716: Knock Sensor 2 (G66) - Signal Too Low
- DTC P0333/16717: Knock Sensor 2 (G66) - Signal Too High

NOTE: It is extremely important that knock sensors are tightened to 15 ft. lbs.(20 Nm), to ensure knock sensors perform perfectly. Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

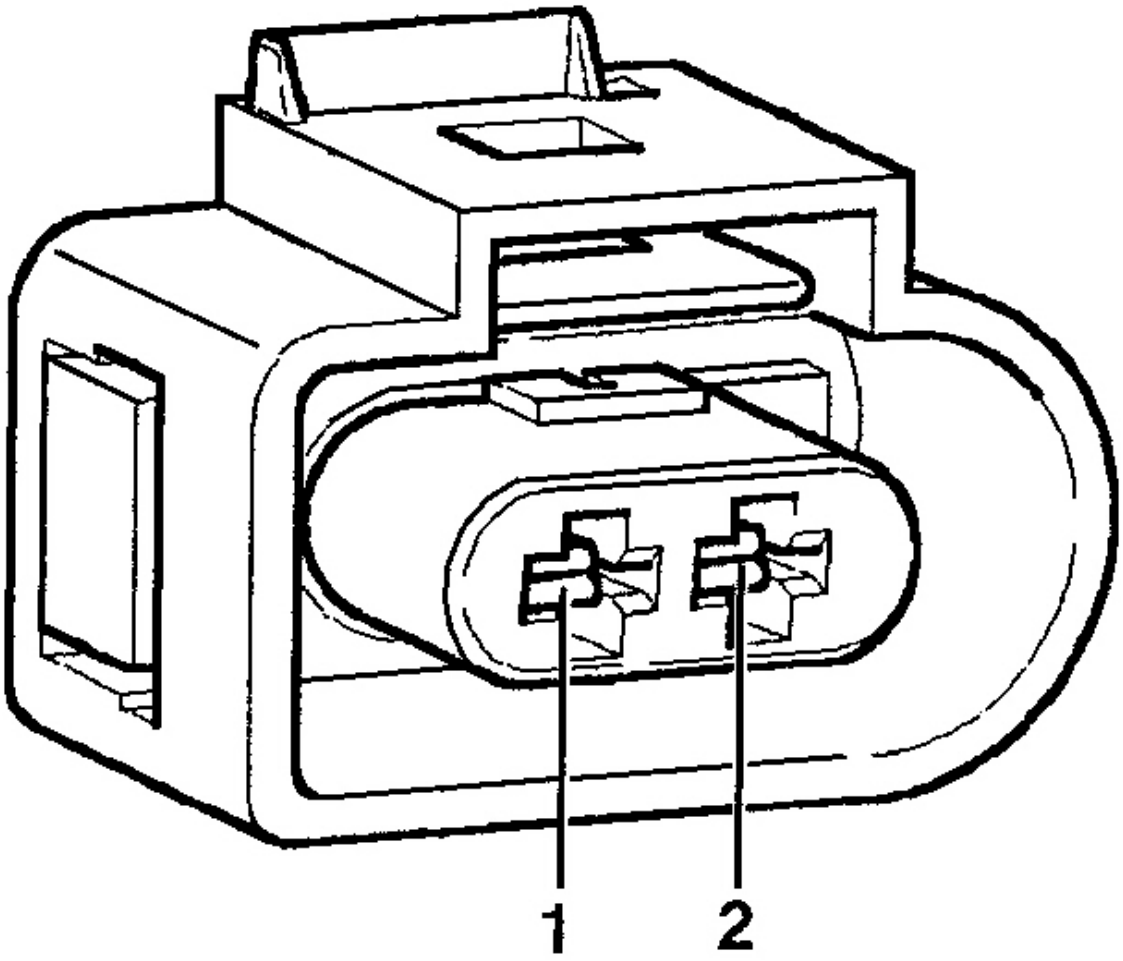
1. Turn ignition off. Disconnect knock sensor No. 1 and 2 harness connectors. Check resistance between contacts at each knock sensor, resistance should be infinite (no continuity). If no continuity is present in resistance reading, go to next step. If continuity is present in resistance reading, replace faulty knock sensor(s). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Turn ignition off. Loosen and retighten knock sensors No. 1 and 2 to 15 ft. lbs.(20 Nm). Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following knock sensor harness connectors and VAG test box sockets. Check wiring for short circuit to one another in Knock sensor No. 1 (G61) harness connector. Check wiring for short circuit to one another in Knock sensor No. 2 (G66) harness connector. See **KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 17** and **Fig. 46** . Resistance should be a maximum of 1.5 ohms for each reading. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Knock Sensor Harness Connector Terminal	VAG Test Box Socket
Knock Sensor No. 1 (G61 - Cylinders 1/2)	

1 (Signal)	106
2 (Ground)	99
Knock Sensor No. 2 (G66 - Cylinders 3/4)	
1 (Signal)	107
2 (Ground)	99

4. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) reset, replace faulty knock sensor(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073508

Fig. 46: Identifying Knock Sensor Harness Connector Test Points (Beetle - Engine Code AWP, GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0327/16711, DTC P0328/16712, DTC P0332/16716 & DTC P0333/16717 (PASSAT)

NOTE: Following procedure applies to Passat only.

Code Definition

- DTC P0327/16711: Knock Sensor 1 (G61) - Signal Too Low
- DTC P0328/16712: Knock Sensor 1 (G61) - Signal Too High
- DTC P0332/16716: Knock Sensor 2 (G66) - Signal Too Low
- DTC P0333/16717: Knock Sensor 2 (G66) - Signal Too High

NOTE: It is extremely important that knock sensors are tightened to 15 ft. lbs.(20 Nm), to ensure knock sensors perform perfectly. Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Turn ignition off. Disconnect knock sensor No. 1 and 2 harness connectors, located at back of coolant reservoir. See **Fig. 47** . Check resistance between contacts No. 1 and 2, No. 1 and 3 and also No. 2 and 3 at each knock sensor, resistance should be infinite (no continuity). If no continuity is present in resistance readings, go to next step. If continuity is present in any resistance reading, replace faulty knock sensor(s). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Turn ignition off. Loosen and retighten knock sensors No. 1 and 2 to 15 ft. lbs.(20 Nm). Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following knock sensor harness connectors and VAG test box sockets. See **KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 47** . Resistance should be a maximum of 1.5 ohms for each reading. Check wiring for short circuit to one another in Knock sensor No. 1 (G61) harness connector. Check wiring for short circuit to one another in Knock sensor No. 2 (G66) harness connector. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Knock Sensor Harness Connector Terminal	VAG Test Box Socket
Knock Sensor No. 1 (G61 - Cylinders 1 & 2)	
1 (Signal)	106
2 (Ground)	99

3 (Wire Shielding)	108
Knock Sensor No. 2 (G66 - Cylinders 3 & 4)	
1 (Signal)	107
2 (Ground)	99
3 (Wire Shielding)	108

4. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) reset, replace faulty knock sensor(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

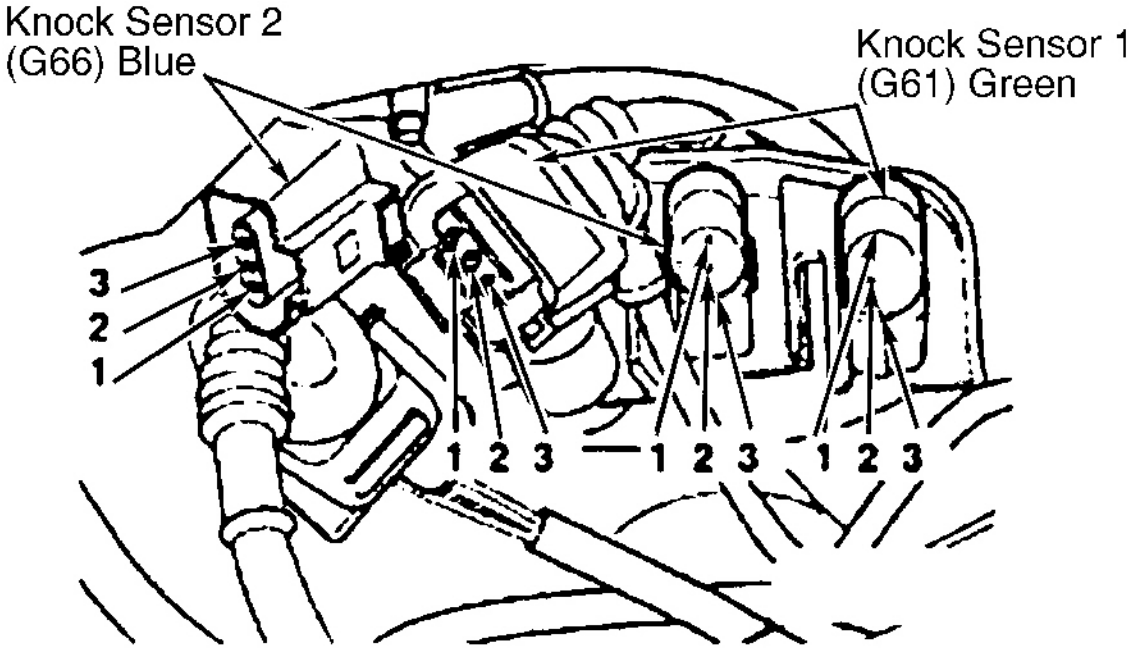


Fig. 47: Identifying Knock Sensor & Harness Connector Test Points (Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0340/16724, DTC P0341/16725, DTC P0342/16726 & DTC P0343/16727

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0340/16724: Camshaft Position Sensor (G163) - Malfunction
- DTC P0341/16725: Camshaft Position Sensor (G163) - Implausible Signal
- DTC P0342/16726: Camshaft Position Sensor (G163) - Signal Too Low

- DTC P0343/16727: Camshaft Position Sensor (G163) - Signal Too High

Test Requirement

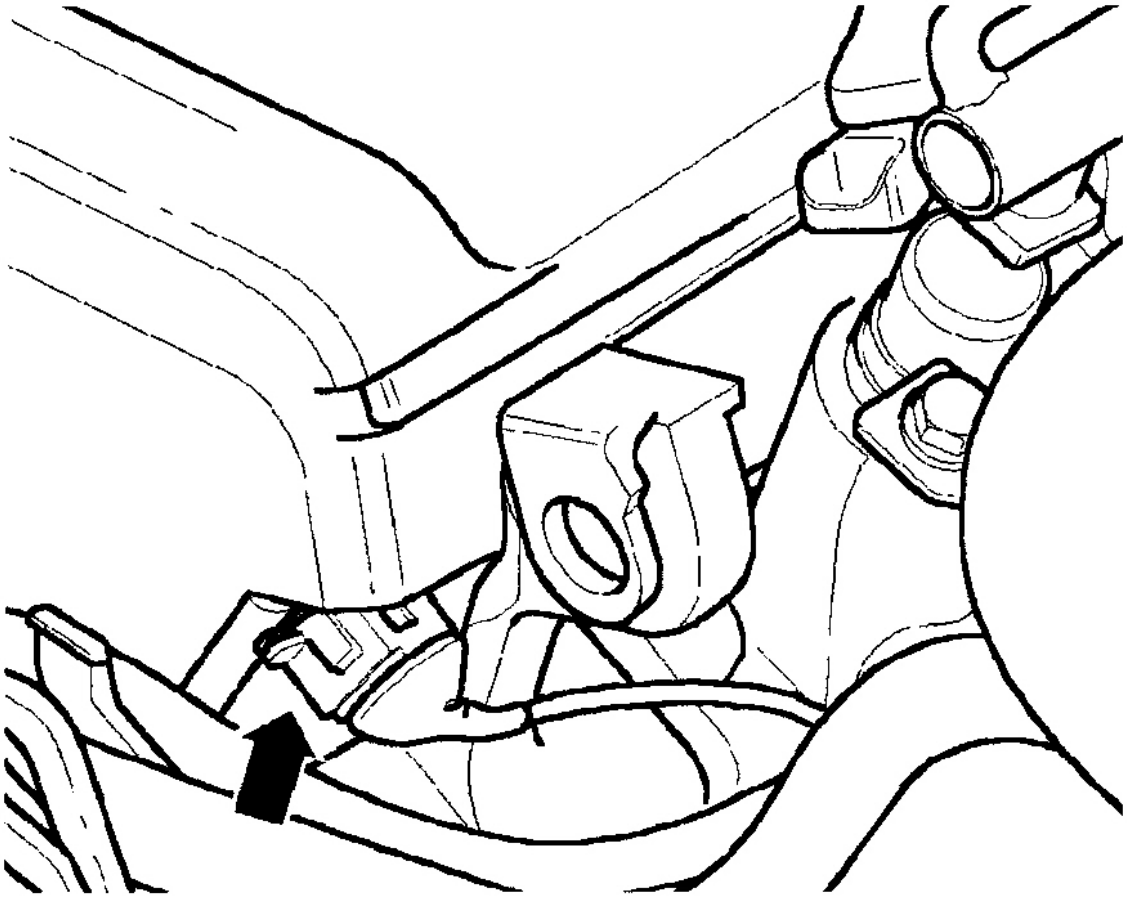
NOTE: Manufacturer's alpha-numeric identification for CMP sensor for Beetle (engine code AWV) is G40, for all other 1.8L turbo models it is (G163).

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). Ensure Camshaft Position (CMP) sensor is bolted on tightly.

Test Procedure

1. Disconnect CMP sensor 3-pin harness connector. See **Fig. 48** . Turn ignition on. Using DVOM measure voltage between terminals No. 1 and 3 of CMP sensor 3-pin harness connector. See **Fig. 49** or **Fig. 50** . Voltage should be a minimum of 4.5 volts. Turn ignition off. If readings are okay, go to next step (additional testing is needed). If readings are not okay, go to next step.
2. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following CMP sensor harness connector terminals and test box sockets. See **Fig. 49** or **Fig. 50** .
   - CMP sensor harness connector terminal No. 1 and test box socket No. 98.
   - CMP sensor harness connector terminal No. 2 and test box socket No. 86.
   - CMP sensor harness connector terminal No. 3 and test box socket No. 108.

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in CMP sensor 3-pin harness connector for short circuits to one another.
3. If CMP sensor harness connector circuits are okay and 4.5 volts minimum is present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace faulty CMP sensor. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If CMP sensor harness connector circuits are okay, but no voltage is present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00064799

Fig. 48: Disconnecting CMP Sensor Harness Connector (Beetle, GTI, Jetta & Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

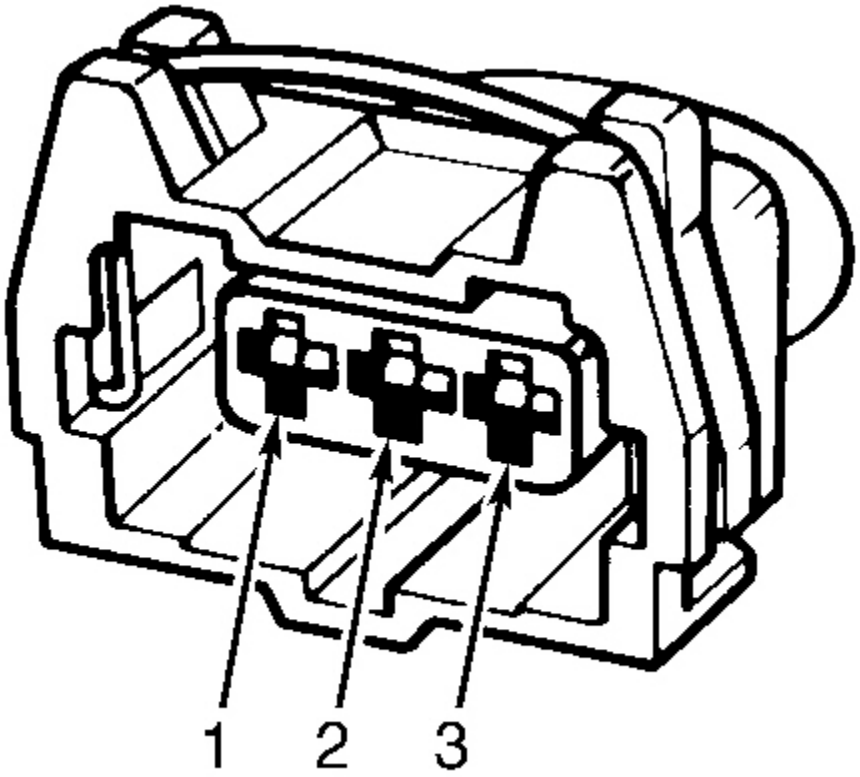


Fig. 49: Identifying Test Points On 3-Pin Harness Connector (Early Model)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

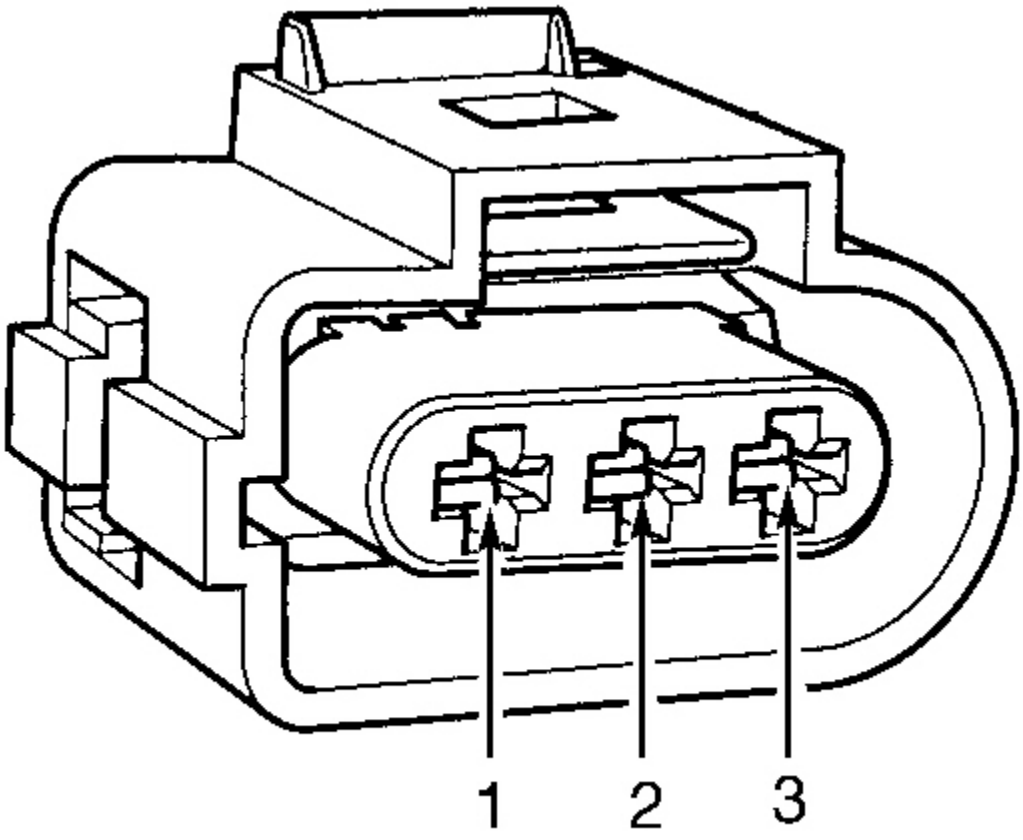


Fig. 50: Identifying Test Points On 3-Pin Harness Connector (Late Model)
Courtesy of VOLKSWAGON UNITED STATES, INC.

DTC P0351/16735, DTC P0352/16736, DTC P0353/16737 & DTC P0354/16738

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0351/16735: Ignition Control Cylinder 1 - Malfunction
- DTC P0352/16736: Ignition Control Cylinder 2 - Malfunction
- DTC P0353/16737: Ignition Control Cylinder 3 - Malfunction
- DTC P0354/16738: Ignition Control Cylinder 4 - Malfunction

Test Requirements

Ensure Camshaft Position sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC**

P1340/17748 . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705 & DTC P0322/16706** . Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Using DVOM, check voltage supply to ignition coil of cylinder indicated by DTC, (e.g. DTC P0354/16738, check voltage supply to ignition coil/output stage at cylinder No. 4). Disconnect ignition coil harness connector. Turn ignition on, engine off. Check voltage between harness connector terminals No.1 and 2. See **Fig. 41** . Check voltage between harness connector terminals No. 1 and 4, each voltage reading should be a minimum of 11.5 volts. Turn ignition off. If no voltage is present, go to next step. If voltage readings are okay, go to step 6 .
2. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 1 and power supply relay using wiring diagram. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 41** . Resistance reading should be a maximum of 1.5 ohms. If resistance reading is okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 2 and ground, and harness connector terminal No. 4 ground. See **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Cylinder	Ignition Coil Harness Connector Terminal	VAG Test Box Socket
1	3	102
2	3	95
3	3	103
4	3	94

5. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6.

WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.

NOTE: Removing fuse No. 32 disables fuel injectors. Ignition coils and final output stages are one component and cannot be replaced individually.

Remove fuse No. 32. Disconnect ignition coil harness connector. Connect LED equipped test light to ignition coil harness connector terminals No. 2 and 3 of cylinder(s) indicated to be misfiring. See **Fig. 41** . Turn ignition on, engine off. Using ignition switch, operate starter, LED must illuminate. If test light does not illuminate, go to step 4 . If test light illuminates, replace faulty ignition coil(s)/output stage(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0411/16795: SECONDARY AIR SYSTEM - INCORRECT FLOW DETECTED

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Ensure engine is mechanically sound.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

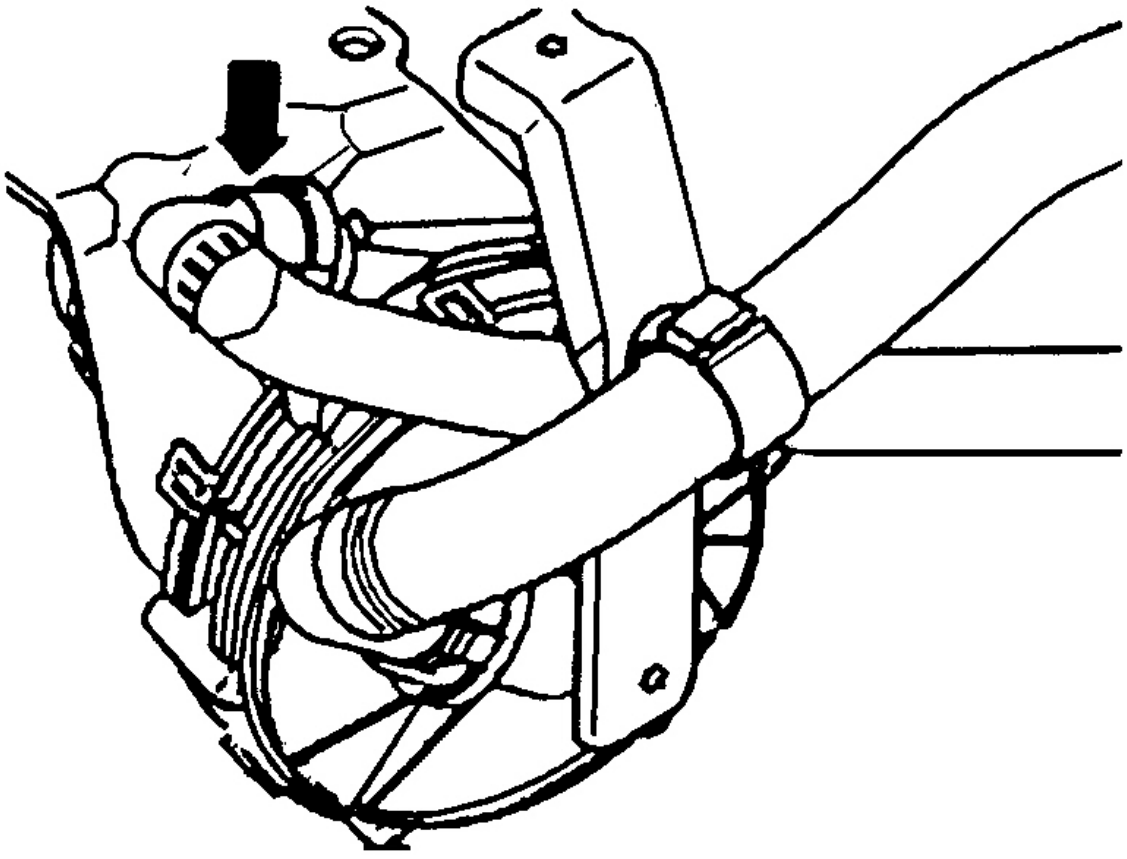
NOTE: Secondary air system is activated by ECM and blows air into exhaust pipe upstream of catalytic converter for 100 seconds during a cold start, 41-91°F (5-33°C). Engine must be cold to perform following test procedure.

1. Ensure fuse and secondary fuse (secondary fuse is 40 Amp and is located in fuse holder on top of battery) are okay. Check hoses and components of Secondary Air Injection System, for damage, loose fit and improper installation, check vacuum hoses for Secondary Air Injection System, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Remove engine cover. Disconnect pressure hose from Secondary Air Pump Motor (V101), by pressing buttons on hose connector. See **Fig. 51** . Using scan tool, check Secondary Air Pump Motor (V101) in scan tool Output Diagnostic Test Mode (Secondary Air Pump Relay activation mode). See **OUTPUT DIAGNOSTIC TEST MODE** . Secondary Air Pump Motor (V101) should run in intervals and air should exit pump at hose connection. If Secondary Air Pump Motor (V101) is okay, go to step 6 . If motor runs and no air exits secondary air pump motor, replace faulty Secondary Air Pump Motor (V101). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE**

RELEARN PROCEDURE . If secondary air pump motor does not run, go to next step.

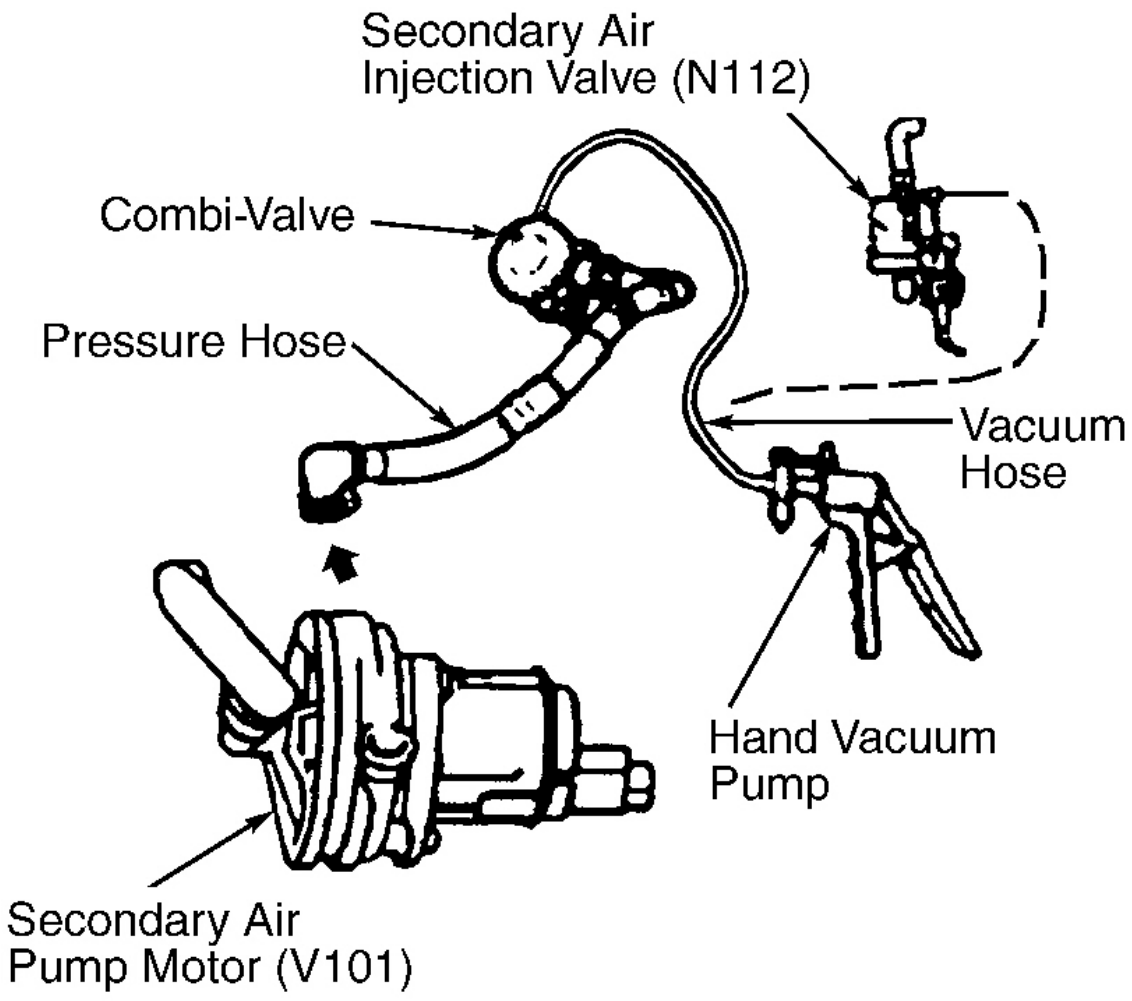
3. Disconnect Secondary Air Pump Motor (V101) harness connector, install LED test light at secondary air pump harness connector terminals. Turn ignition on. Using scan tool, activate Secondary Air Pump Motor (V101) in scan tool Output Diagnostic Test Mode (Secondary Air Pump Relay activation mode). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light at Secondary Air Pump Motor (V101) harness connector should flash. If LED test light at Secondary Air Pump Motor (V101) harness connector does not flash, go to next step. If LED test light at Secondary Air Pump Motor (V101) harness connector flashes, replace faulty Secondary Air Pump Motor (V101). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Using DVOM check resistance of Secondary Air Pump Motor (V101) wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring for short circuit to one another in Secondary Air Pump Motor (N101) harness connector. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If Secondary Air Pump Motor (N101) wiring is okay, go to next step.
5. Check Secondary Air Pump Relay (J299) and Secondary Air Pump Relay (J299) wiring. See **DTC P0418/16802: SECONDARY AIR PUMP RELAY (J299), MALFUNCTION** . Repair or replace as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. **NOTE: Do not use compressed air to check Combi-Valve.**

   Disconnect vacuum hose from Secondary Air Injection Valve (N112) and disconnect pressure hose from secondary air pump motor, press buttons on pressure hose connector to disconnect pressure hose. See **Fig. 52** . Blow lightly into disconnected pressure hose, Combi-Valve should be closed. Connect hand vacuum pump to disconnected vacuum hose and apply vacuum to Combi-Valve, Combi-Valve should open. If Combi-Valve opens when vacuum is applied, Combi-Valve is okay, go to next step. If Combi-Valve does not open when vacuum is applied, replace faulty Combi-Valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Check Secondary Air Injection Valve (N112). See **DTC P0412/16796, DTC P0413/16797 & DTC P0414/16798** . Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083399

Fig. 51: Locating Secondary Air Pump Motor (V101) Air Pressure Outlet Connector
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083402

Fig. 52: Identifying Secondary Air System Components & Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0412/16796, DTC P0413/16797 & DTC P0414/16798

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P0412/16796: Secondary Air Injection Valve (N112) - Electrical Circuit Malfunction
- DTC P0413/16797: Secondary Air Injection Valve (N112) - Open Circuit
- DTC P0414/16798: Secondary Air Injection Valve (N112) - Short Circuit

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Ensure engine is mechanically sound.

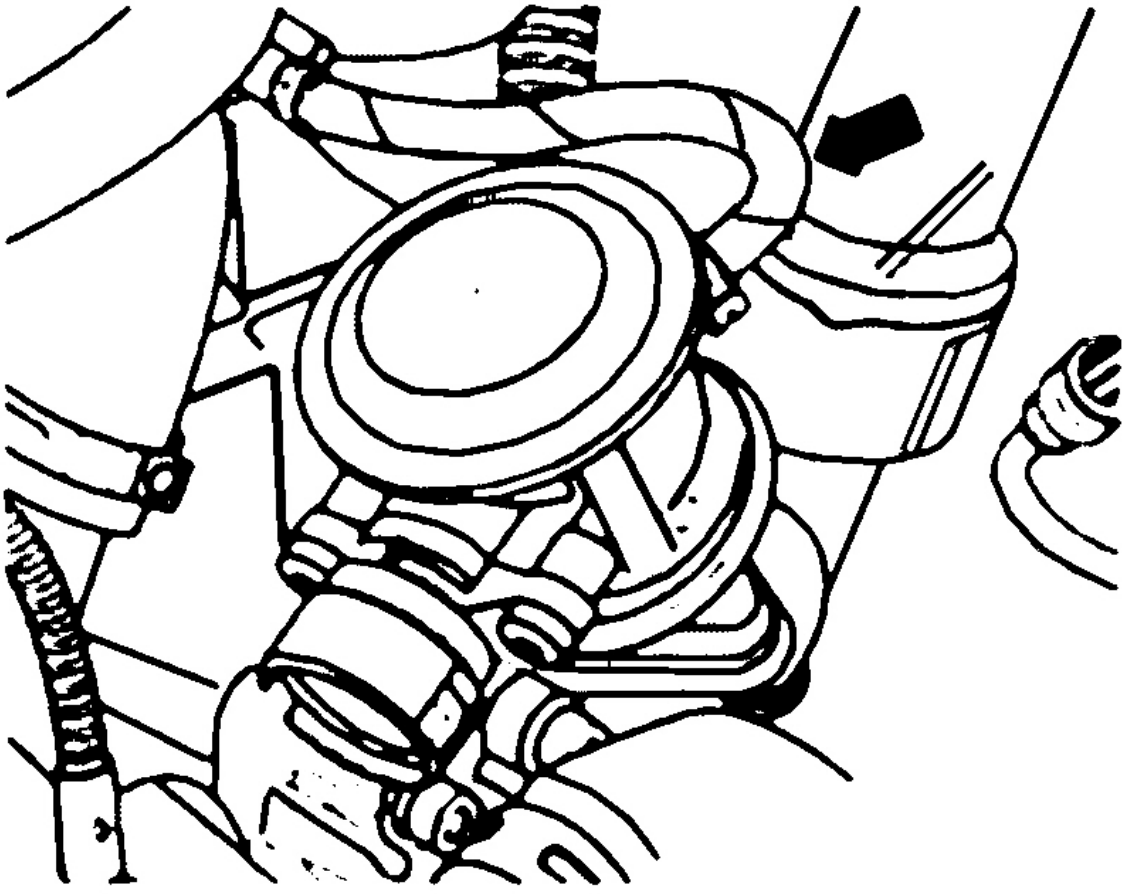
Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: Secondary air system is activated by ECM and blows air into exhaust pipe upstream of catalytic converter for 100 seconds during a cold start, 41-91°F (5-33°C). Engine must be cold to perform following test procedure.

Check hoses and components of Secondary Air Injection System, for damage, loose fit and improper installation, check vacuum hoses for Secondary Air Injection System, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

1. Check vacuum hoses for Secondary Air Injection System, repair as necessary, go to next step.
2. Using scan tool, check Secondary Air Injection Valve (N112). See **OUTPUT DIAGNOSTIC TEST MODE** . Secondary Air Injection Valve should audibly click. If Secondary Air Injection Valve clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If Secondary Air Injection Pump Relay does not click, go to step, 4 . If DTC(s) resets, go to next step.
3. Disconnect vacuum hose from Combi-Valve. See **Fig. 53** . Start engine and idle, vacuum should be present when Secondary Air Pump Motor (V101) is running. If no vacuum is present, go to next step. If vacuum is present, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Disconnect harness connector from Secondary Air Injection Valve (N112). Connect LED test light to secondary air injection valve harness connector, start engine, LED test light should illuminate. If test light does not illuminate, go to next step. If test light illuminates, replace faulty Secondary Air Injection Valve (N112). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Using DVOM check resistance of Secondary Air Injection Valve (N112) wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring for short circuit to one another in Secondary Air Injection Valve (N112) harness connector. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083398

Fig. 53: Locating Secondary Air Injection Valve/Combi-Valve Vacuum Hose (GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0418/16802: SECONDARY AIR PUMP RELAY (J299) - MALFUNCTION

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Ensure engine is mechanically sound.

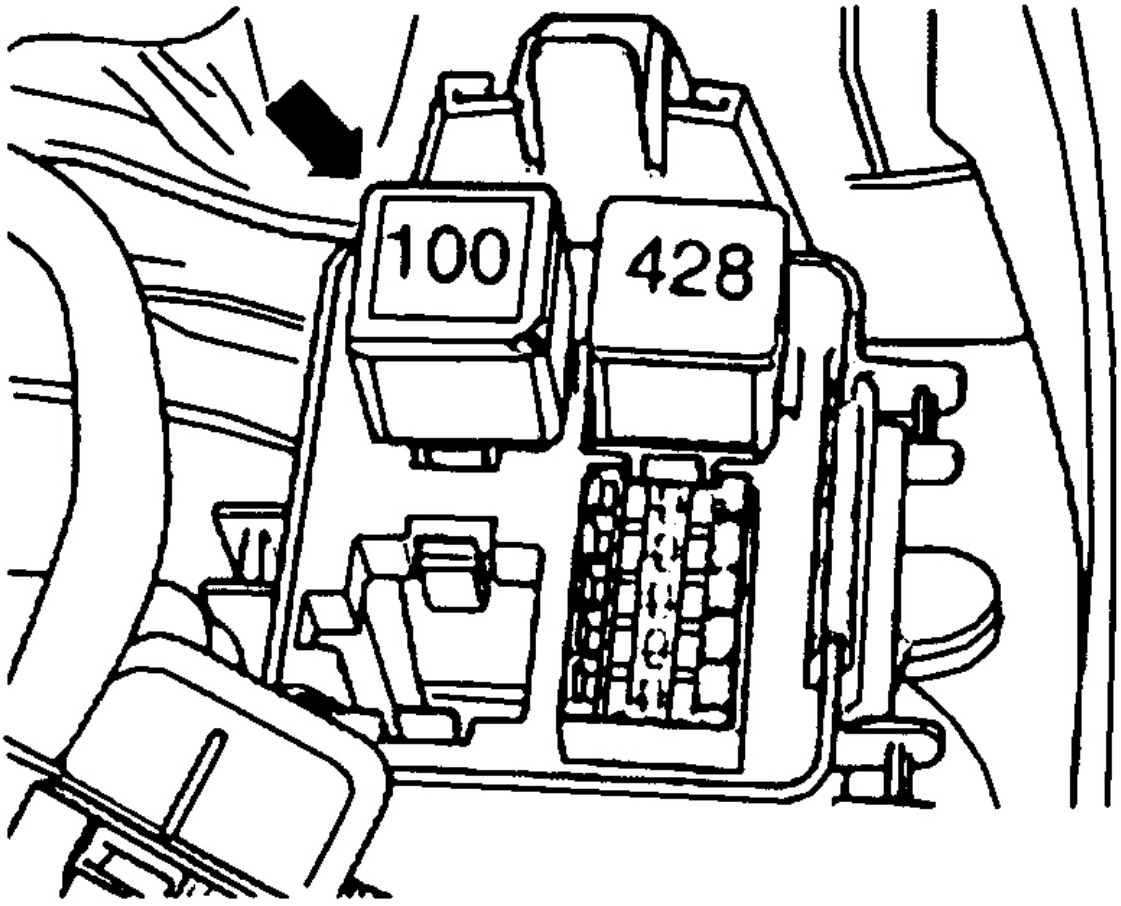
Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Using scan tool, check Secondary Air Injection Pump Relay (J299). See **OUTPUT DIAGNOSTIC TEST MODE** . Secondary Air Injection Pump Relay should audibly click. Secondary Air Injection

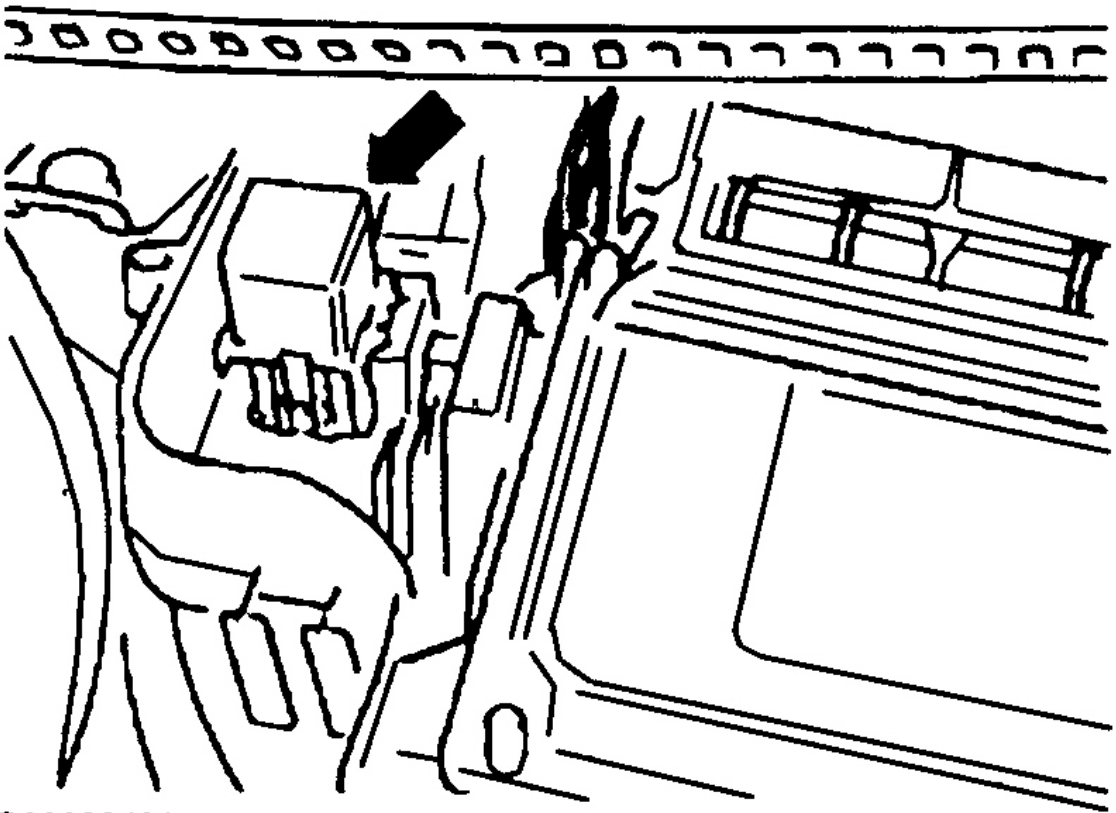
Pump Relay (J299) for Beetle is located in relay/fuse box next to master cylinder. For GTI, Jetta and Passat. See **Fig. 54** and **Fig. 55** . If Secondary Air Injection Pump Relay clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If Secondary Air Injection Pump Relay does not click or DTC P0418/16802 resets, go to next step.

2. Using DVOM check resistance of Secondary Air Injection Pump Relay wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. If resistance is okay, replace faulty Secondary Air Injection Pump Relay (J299). Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083400

Fig. 54: Locating Secondary Air Injection Pump Relay (J299 - GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083401

Fig. 55: Locating Secondary Air Injection Pump Relay (J299 - Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0420/16804 & DTC P0422/16806

Code Definition

- DTC P0420/16804: Catalyst System - Efficiency Below Threshold
- DTC P0422/16806: Catalyst System - Efficiency Below Threshold

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. Check control of upstream TWC HO2S. See **DTC P0131/16515 & DTC P0132/16516** . If control of

upstream TWC HO2S is okay, go to next step. If control of upstream TWC HO2S is not okay, repair wiring or replace upstream TWC HO2S as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. Check control of downstream TWC HO2S. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If control of downstream TWC HO2S is okay, go to next step. If control of downstream TWC HO2S is not okay, repair wiring or replace downstream TWC HO2S as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Check aging of upstream TWC HO2S, for engine codes AWV and AWM. See **DTC P0133/16517 & DTC P0134/16518** . If aging of upstream TWC HO2S is okay, go to next step. If aging of upstream TWC HO2S is not okay, repair wiring or replace upstream TWC HO2S as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check aging of upstream TWC HO2S, for engine code AWP. See **DTC P0133/16517 & DTC P0134/16518** . If aging of upstream TWC HO2S is okay, go to next step. If aging of upstream TWC HO2S is not okay, repair wiring or replace upstream TWC HO2S as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to check catalytic convertor.**

   Follow scan tool manufacturer's instructions, for checking catalytic converter. If catalytic converter is not okay, replace faulty catalytic converter. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If catalytic converter is okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC P0420/16804 or DTC P0422/16806 do not reset after test drive, test is complete.

DTC P0440/16824 & DTC P0441/16825

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0440/16824: EVAP, Fuel Tank Ventilation System - Malfunction
- DTC P0441/16825: EVAP, Fuel Tank Ventilation System - Flow Rate Malfunction

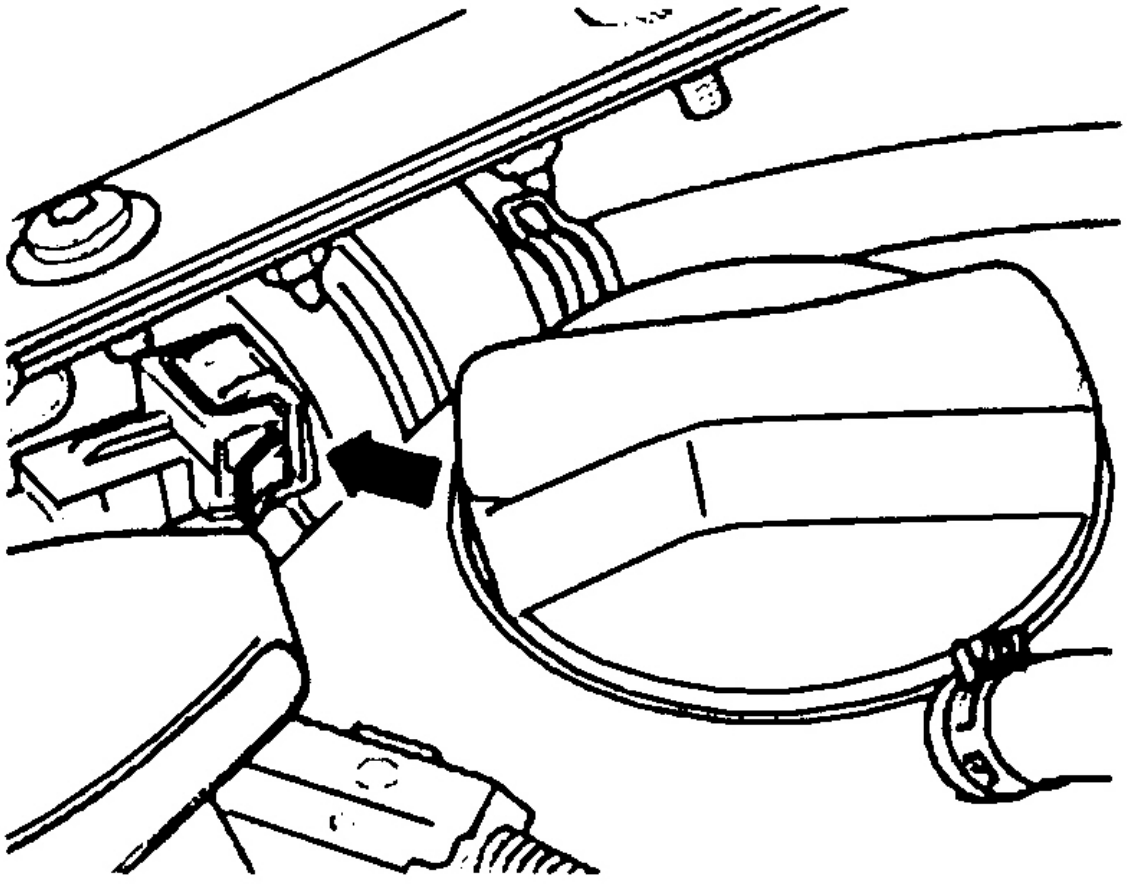
Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

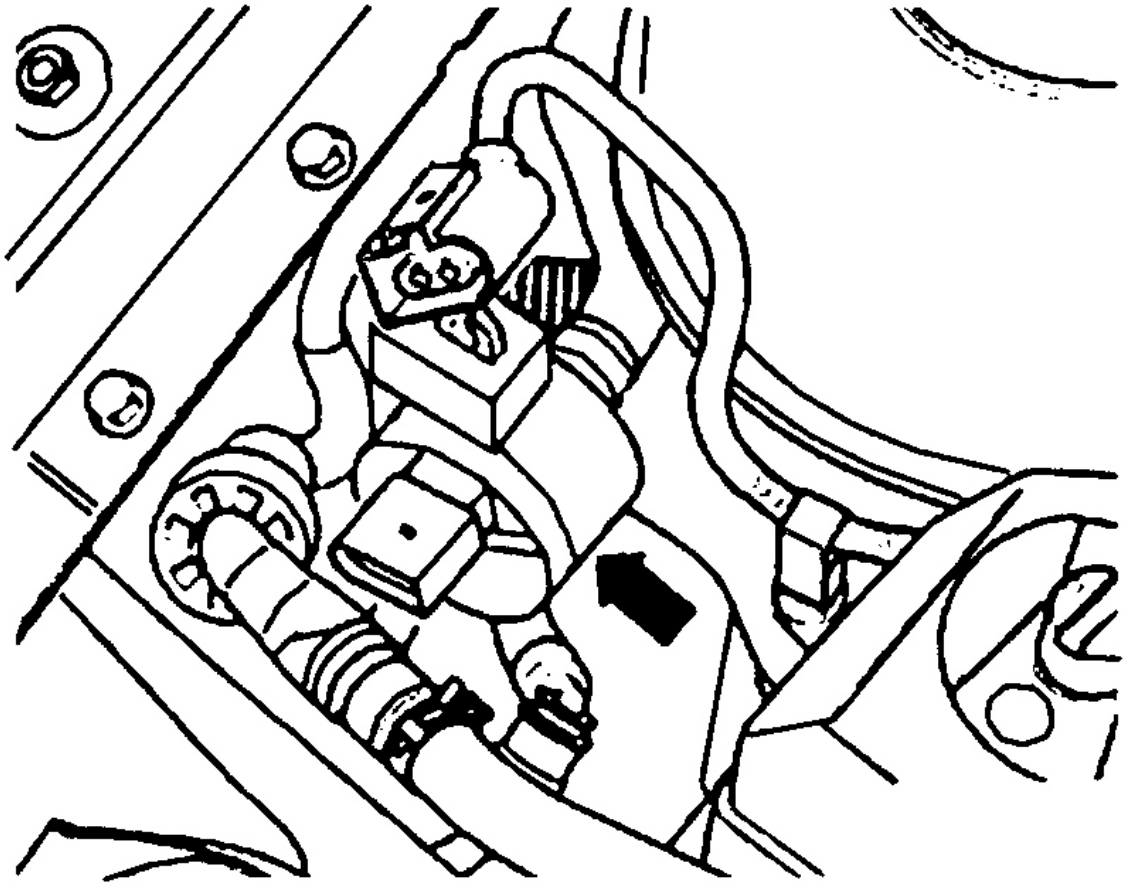
NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Canister Purge Valve (N80) should audibly click. EVAP Canister Purge Valve (N80) for Beetle, GTI and Jetta are located in engine compartment, center of right side fender, and for Passat by bottom of air cleaner. See **Fig. 56** and **Fig. 57** . If EVAP Canister Purge Valve (N80) clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If EVAP Canister Purge Valve (N80) does not click or DTC P0440/16824 or P0441/16825 resets, go to next step.
3. Turn ignition off. Disconnect harness connector from EVAP Canister Purge Valve (N80). Connect LED test light to EVAP canister purge valve harness connector. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash. If test light does not flash, go to next step. If test light flashes, replace faulty EVAP Canister Purge Valve (N80). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Using DVOM check resistance of EVAP Canister Purge Valve (N80) harness connector wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in harness connector for short circuits to one another and to ground and B+. If resistance is okay and no shot circuits are present, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083403

Fig. 56: Locating EVAP Canister Purge Valve (N80 - Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083404

Fig. 57: Locating EVAP Canister Purge Valve (N80 - GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0442/16827: EVAP EMISSION CONTROL SYSTEM - SMALL LEAK DETECTED

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure intake air is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C). Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or

VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

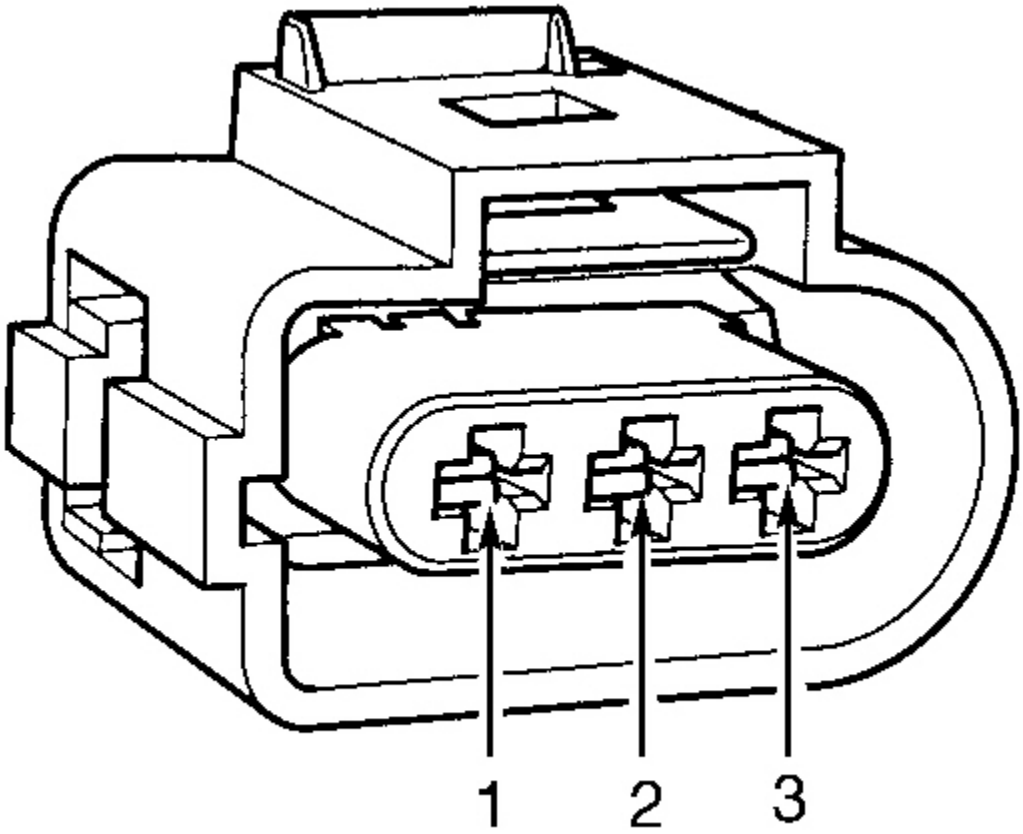
1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions, check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. See EVAP System Overview in appropriate SYSTEM & COMPONENT TESTING. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If DTC returns on test drive, go to next step.
3. Check EVAP Canister Purge Valve (N80). See **DTC P0440/16824 & DTC P0441/16825** .
4. Check EVAP Leak Detection Pump (V144) using Output Diagnostic Test Mode. See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals. If EVAP Leak Detection Pump (V144) does not run, go to next step.
5. Disconnect EVAP Leak Detection Pump (V144) harness connector, install LED test light at EVAP leak detection pump harness connector terminals No. 2 and 3. See **Fig. 58** . Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light at EVAP Leak Detection Pump (V144) harness connector should flash. If LED test light at EVAP Leak Detection Pump (V144) harness connector does not flash, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 58** .
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

   Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1

and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.

7. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G97D07183

Fig. 58: Identifying EVAP Leak Detection Pump (V144) Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0443/16827: EVAP FUEL TANK VENTILATION SYSTEM - ELECTRICAL CIRCUIT MALFUNCTION (PASSAT)

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: DTC P0443/16827 is for Passat only.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Canister Purge Valve (N80) should audibly click. EVAP Canister Purge Valve (N80) for Beetle, GTI and Jetta are located in engine compartment, center of right side fender, and for Passat by bottom of air cleaner. See **Fig. 56** and **Fig. 57** . If EVAP Canister Purge Valve (N80) clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If EVAP Canister Purge Valve (N80) does not click or DTC P0440/16824 or P0441/16825 resets, go to next step.
2. Turn ignition off. Disconnect harness connector from EVAP Canister Purge Valve (N80). Connect LED test light to EVAP canister purge valve harness connector. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash. If test light does not flash, go to next step. If test light flashes, replace faulty EVAP Canister Purge Valve (N80). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Using DVOM check resistance of EVAP Canister Purge Valve (N80) harness connector wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in harness connector for short circuits to one another and to ground and B+. If resistance is okay and no shot circuits are present, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0444/16828 & DTC P0445/16829

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P0444/16828: EVAP Canister Purge Valve (N80) - Open Circuit
- DTC P0445/16829: EVAP Canister Purge Valve (N80) - Short Circuit

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Canister Purge Valve (N80) should audibly click. EVAP Canister Purge Valve (N80) for Beetle, GTI and Jetta are located in engine compartment, center of right side fender, and for Passat by bottom of air cleaner. See **Fig. 56** and **Fig. 57** . If EVAP Canister Purge Valve (N80) clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If EVAP Canister Purge Valve (N80) does not click or DTC P0440/16824 or P0441/16825 resets, go to next step.
2. Turn ignition off. Disconnect harness connector from EVAP Canister Purge Valve (N80). Connect LED test light to EVAP canister purge valve harness connector. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash. If test light does not flash, go to next step. If test light flashes, replace faulty EVAP Canister Purge Valve (N80). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Using DVOM check resistance of EVAP Canister Purge Valve (N80) harness connector wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in harness connector for short circuits to one another and to ground and B+. If resistance is okay and no shot circuits are present, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0455/16839 & DTC P0456/16840

Code Definitions

- DTC P0455/16839: EVAP Emission Control System - Very Large Leak Detected
- DTC P0456/16840: EVAP Emission Control System - Very Small Leak Detected

Test Requirements

Ensure intake air is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C). Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions, check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. See EVAP System Overview in appropriate SYSTEM & COMPONENT TESTING. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If DTC returns on test drive, go to next step.
3. Check EVAP Canister Purge Valve (N80). See **DTC P0440/16824 & DTC P0441/16825** .
4. Using scan tool, check EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals. If EVAP Leak Detection Pump (V144) does not run, go to next step.
5. Disconnect EVAP Leak Detection Pump (V144) harness connector, install LED test light at EVAP leak detection pump harness connector terminals No. 2 and 3. See **Fig. 58** . Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light at EVAP Leak Detection Pump (V144) harness connector should flash. If LED test light at EVAP Leak Detection Pump (V144) harness connector does not flash, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect

Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 58** .

- EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
- EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.
- EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1 and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.

7. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

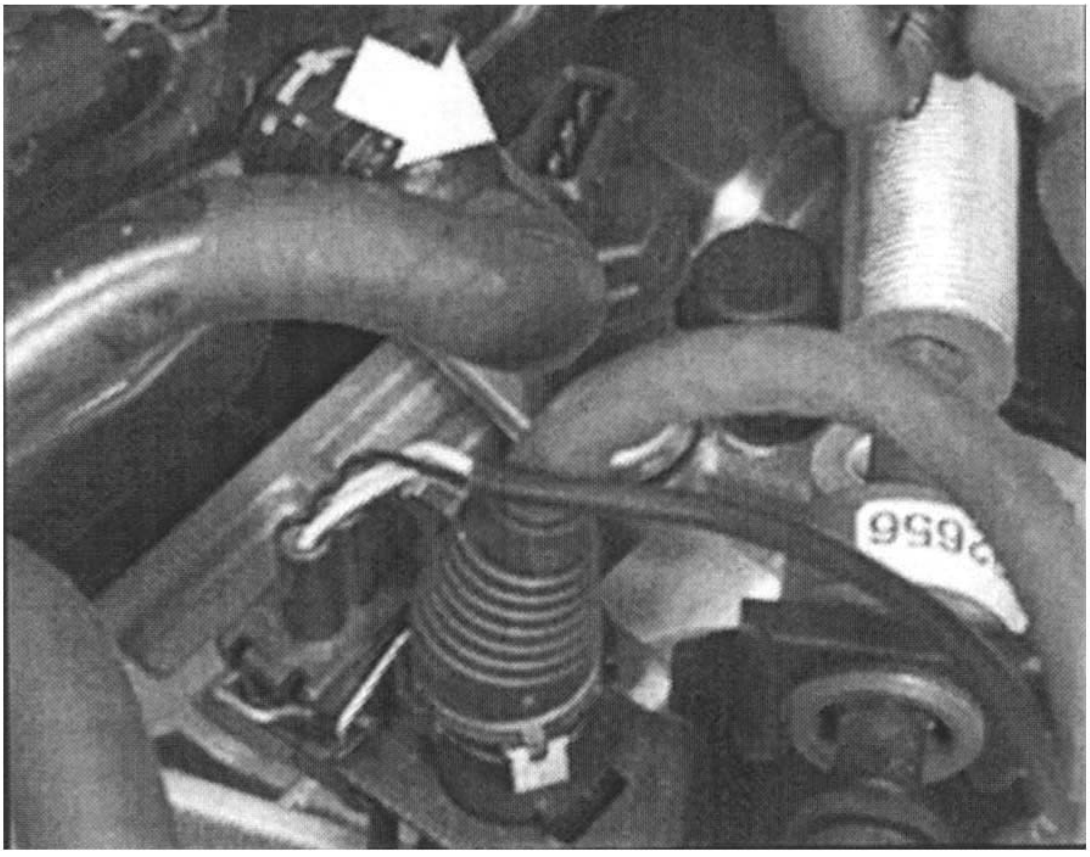
DTC P0501/16885: VEHICLE SPEED SIGNAL - IMPLAUSIBLE SIGNAL

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C).

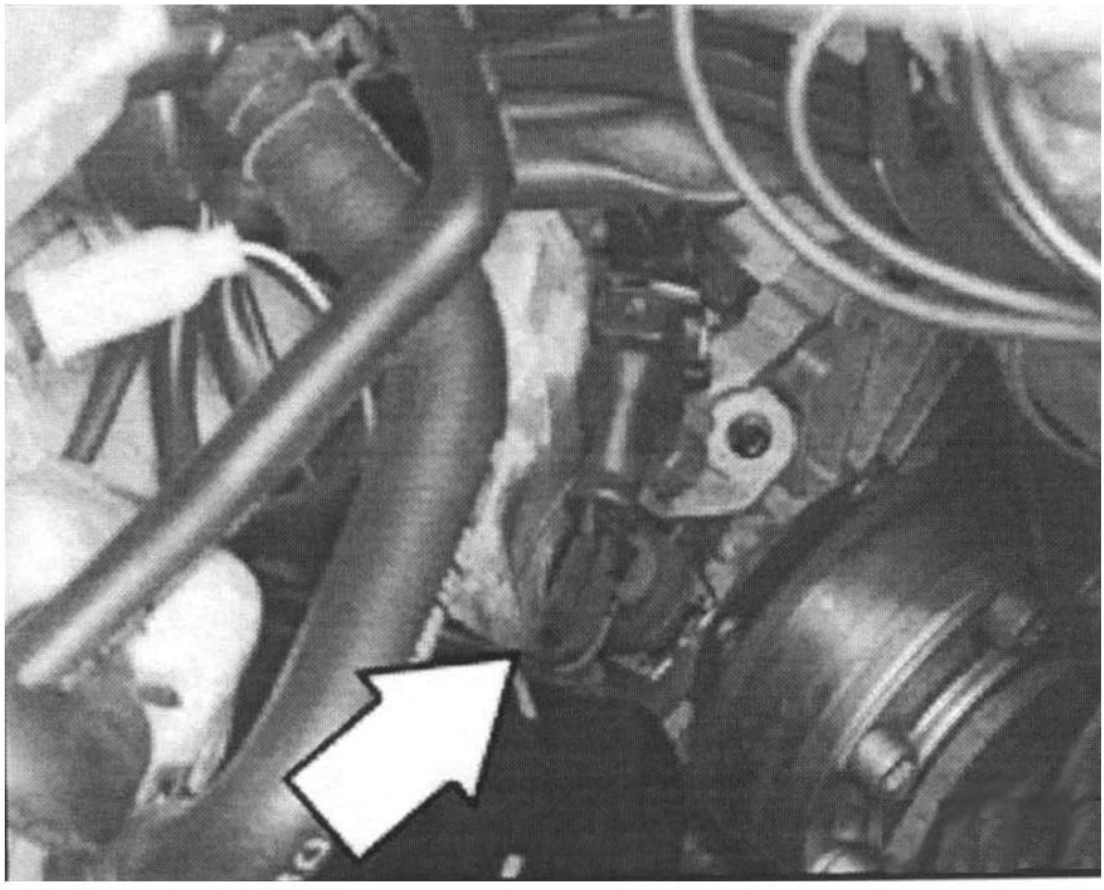
Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off.
2. Following scan tool manufacturer's instructions, check vehicle speed signal. Vehicle must be test driven to check speed signal. With help from a second person in the back seat to read scan tool, observe scan tool display. Scan tool display should be approximately driven speed. If no speed is displayed on scan tool, go to next step. If scan tool and speedometer displays approximately driven speed. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC P0501/16885 did not return on test drive, test is complete.
3. Turn ignition off. Disconnect Engine Control Module (ECM) harness connector. Connect Test Box (VAG 1598/31) to ECM harness connector, leave ECM disconnected. See **CONNECTING VAG TEST BOX** .
4. Raise one front wheel off the ground. Measure voltage between terminals No. 3 and 54 at test box while rotating front wheel. Voltage should fluctuate between 0 and 4 volts. If voltage does not fluctuate, check Vehicle Speed sensor (G22) wiring for open and short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If wiring is okay, replace faulty Vehicle Speed sensor (G22). See **Fig. 59** and **Fig. 60** . Erase DTC memory.
5. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring is not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083396

Fig. 59: Locating Vehicle Speed Sensor, For A/T On Top Of Differential Housing (G22 - Beetle)
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083397

Fig. 60: Locating Vehicle Speed Sensor, For M/T On Left Side OF Transaxle, Below Back-Up Light Switch (G22 - Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P0506/16890 & DTC P0507/16891

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P0506/16890: Idle Speed Control - RPM Too Low
- DTC P0507/16891: Idle Speed Control - RPM Too High

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors

and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. **NOTE: If TVCM (J338) is replaced, it must be adapted to the ECM and A/T control module (if equipped).**

   Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check Accelerator Pedal Position (APP) sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase

DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.

5. Replace APP sensors as necessary. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118
6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0513/16897: IMMOBILIZER - INCORRECT CODE

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C).

Immobilizer Adaptation To ECM (J220)

NOTE: For Model Year 2001, manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052. Starting with Model Year 2002 Golf and Jetta are equipped with Immobilizer Generation III (Starting 6/2001 for Beetle). Ignition keys for Immobilizer III may be marked "W3". For more reliable differentiation, always use the function "check control module version". Scan Tool VAS 5051 or 5052 must be used for Immobilizer Generation III diagnoses and coding. A correct Importer/Dealer number must reside in VAS 5051 or VAS 5052 in order to request a PIN number and to adapt Immobilizer Generation III.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Instrument Cluster Control Module (J285) for immobilizer DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary, verify repair erase DTC memory, go to next step.
2. **NOTE: Identity of ECM is read into the immobilizer control module next time ignition is switched on.**

   Adapt immobilizer to ECM. Authorized vehicle key required. Connect scan tool. Switch ignition on. Follow scan tool manufacturer's instructions for immobilizer adaptation to ECM, turn ignition off, turn ignition back on within 60 seconds. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0532/16916 & DTC P0533/16917 (BEETLE)

NOTE: DTC P0532/16916 and P0533/16917 are for Beetle only.

Code Definition

- DTC P0532/16916: A/C Pressure Signal - Too Small
- DTC P0533/16917: A/C Pressure Signal - Too Large

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: AUTOMATIC A/C-HEATER SYSTEM is referred to by Volkswagen as Climatronic system and is a fully automatic climate control system.

Check A/C Control Module (J255) for DTC(s). See appropriate AUTOMATIC A/C-HEATER SYSTEM article, under HVAC. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0560/16944, DTC P0562/16946 & DTC P0563/16947

Code Definition

- DTC P0560/16944: ECM (J220) Voltage Supply - Implausible Signal
- DTC P0562/16946: ECM (J220) Voltage Supply - Too Low
- DTC P0563/16947: ECM (J220) Voltage Supply - Too High

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Test Procedure

NOTE: Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052). The following tests are preformed using Scan Tool (VAG 1551/1552 or VAS 5051/5052), for other scan tools, following scan tool manufacturer's instructions. For location of Data Link Connector (DLC), see RETRIEVING DIAGNOSTIC TROUBLE CODES .

1. Ensure battery is okay. Ensure battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure battery and engine to body grounds are okay. Repair as necessary. Turn off all electrical consumers and A/C. Shift lever in park (A/T) or neutral (M/T) and set parking brake. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle.
2. Using scan tool. Read supply voltage for ECM. Voltage should be 12-14.5 volts. End scan tool data output. Turn ignition off. If voltage is less than 12V, go to next step. If voltage is more than 14.5 volts, go to step 4 . If voltage checks are okay. ECM power and ground circuits are okay. Test is complete.
3. Check battery, alternator, parasitic load and ECM grounds. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. If repairs where performed, repeat steps 1 and 2 . If battery, alternator, parasitic load and ECM grounds are okay, go to step 5 .

4. Possible cause is alternator and/or voltage regulator failure. Repair as necessary. If repairs were performed, repeat steps 1 and 2 . If alternator and voltage regulator are okay, go to next step.
5. Turn ignition off. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** and go to next step.
6. **NOTE: If test box is not available. Use wiring diagram and DVOM to check ECM grounds and voltage supply, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.**

   Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and DVOM. Measure voltage supply at test box sockets No. 1 and 62 (ground and B+ 30). Battery voltage should be present. Measure voltage supply at test box sockets No. 2 and 3 (ground and ignition 15). Battery voltage should be present. If either voltage tests have failed, for all models (except Beetle engine code AWV) go to next step. For Beetle (engine code AWV) go to step 8 . If both voltage checks are okay. ECM power and ground circuits are okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. On all models (except Beetle engine code AWV), check voltage supply through ECM power supply relay. Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and a DVOM, measure voltage supply at test box sockets No. 2 and 121. Battery voltage should be present. Check continuity of wire from terminal No. 21 at ECM to ECM power supply relay No. 5, (No. 4 on relay for Passat). If any voltage tests have failed, go to next step. If voltage and continuity checks are okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check wiring connections on relay panel. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. Verify repairs. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0568/16952: CRUISE CONTROL SYSTEM SWITCH (E45) - IMPLAUSIBLE SIGNAL

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check cruise control system for DTCs. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0571/16955: BRAKE LIGHT SWITCH (F) - IMPLAUSIBLE SIGNAL

NOTE: OBD system monitors both Brake Light Switch (F) and Brake Pedal Switch

(F47).

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Brake Light Switch (F) for DTCs in Brake Systems OBD. See appropriate BRAKE SYSTEMS article. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check Brake Light Switch (F). Remove trim to access clutch vacuum vent switch and disconnect brake light switch harness connector. Using DVOM check resistance at brake light switch contacts 1 and 4, resistance should be infinite (open circuit), depress brake pedal, resistance should be approximately 0 ohms (closed circuit), check resistance at brake light switch contacts 2 and 3, resistance should be approximately 0 ohms (closed circuit), depress brake pedal, resistance should be infinite (open circuit). If Brake Light Switch (F) is okay, go to next step. If Brake Light Switch (F) is not okay, replace faulty Brake Light Switch (F). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using DVOM check Brake Light Switch (F) harness connector wiring resistance. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check Brake Light Switch (F) harness connector wiring for short circuit to one another, short circuit to ground, and short circuit to B+. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If Brake Light Switch (F) is okay and wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P0600/16984: DRIVETRAIN DATA BUS - MISSING SIGNAL

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine control module communicates with all control modules capable of

transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

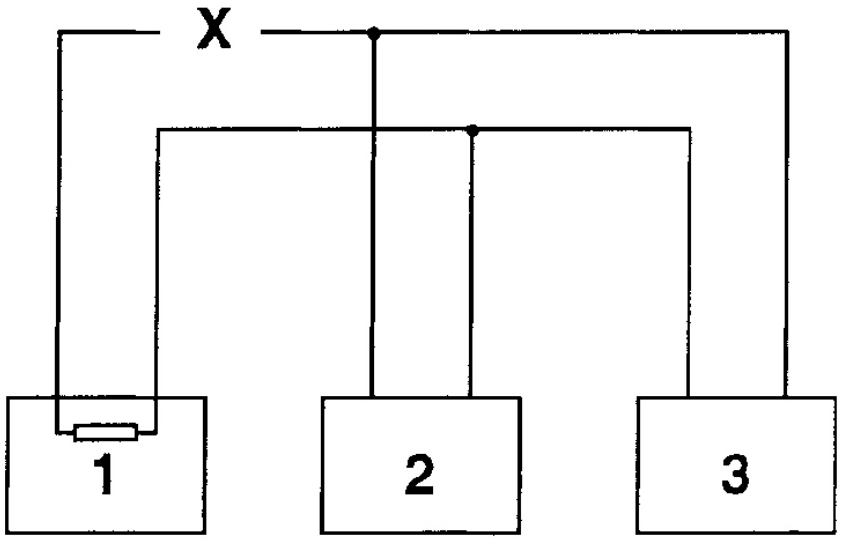
Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Transmission Control Module (J217) and ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Transmission Control Module (J217), ABS Control Module (J104) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

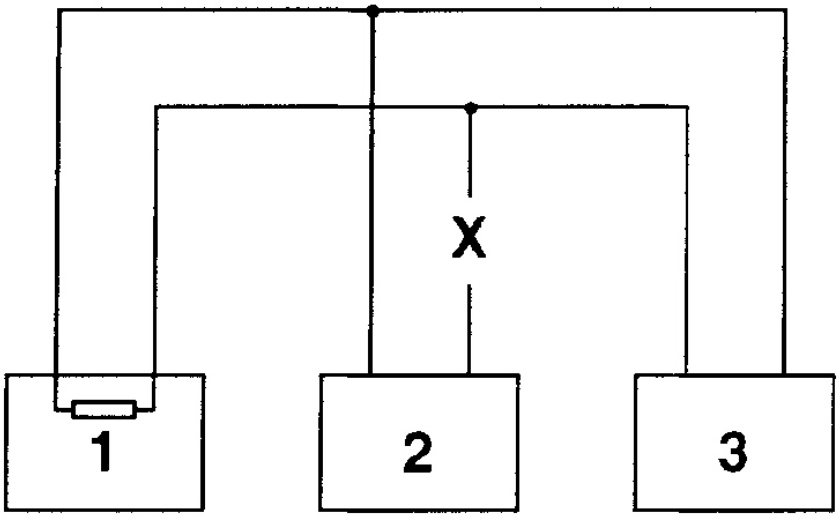


Example 1:

Control module	DTCs stored in DTC memories:
1	◆ Missing signal from control module 2 ◆ Missing signal from control module 3
2	◆ Missing signal from control module 1
3	◆ Missing signal from control module 1

G00077136

Fig. 61: Example 1: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.

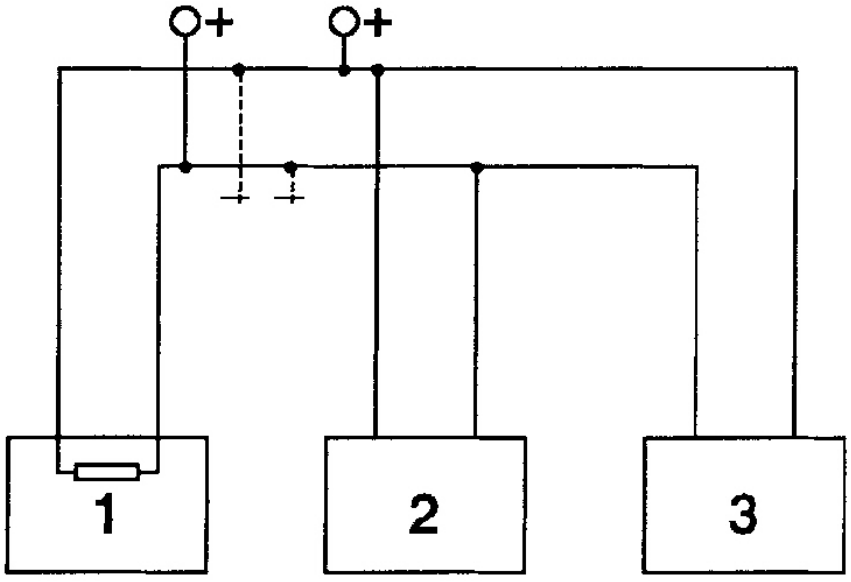


Example 2:

Control module	DTCs stored in DTC memories:
1	◆ Missing signal from control module 2
2	◆ Missing signal from control module 1 ◆ Missing signal from control module 3
3	◆ Missing signal from control module 2

G00077140

Fig. 62: Example 2: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.



Example 3:

Control module	DTCs stored in DTC memories:
1	◆ Powertrain CAN-bus faulty
2	◆ Powertrain CAN-bus faulty
3	◆ Powertrain CAN-bus faulty

G00077144

Fig. 63: Example 3: Locating Non-Communicating Control Module
Courtesy of AUDI OF AMERICA, INC.

DTC P0601/16985, DTC P0602/16986, DTC P0604/16988, DTC P0605/16989 & DTC P0606/16990

Code Definition

- DTC P0601/16985: ECM (J220) - Malfunction
- DTC P0602/16986: ECM (J220) - Programming Malfunction
- DTC P0604/16988: ECM (J220) - Malfunction
- DTC P0605/16989: ECM (J220) - Malfunction

- DTC P0606/16990: ECM (J220) - Malfunction

NOTE: DTC P0601/16985, DTC P0602/16986, DTC P0604/16988 and DTC P0606/16990 may set if battery voltage (ECM voltage supply) is to low when vehicle is being started.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below.

   Beetle
   Turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

   GTI and Jetta
   Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

   Passat
   Turn ignition off. ECM is located at left rear of engine compartment. Remove ECM protective cover and retaining bracket. See **Fig. 7** . Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.
4. After installing ECM perform following procedures:
   - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
   - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
   - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
   - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .

- On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
- On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
- On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
- Perform idle check. See **IDLE CHECK** .
- Generate ECM readiness code. See **READINESS CODE** .

P0638/17022: THROTTLE VALVE CONTROL MODULE (J338) - IMPLAUSIBLE SIGNAL

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control**

module (if equipped).

Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
5. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118

6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

P0642/17026: KNOCK SENSOR - ECM MALFUNCTION (PASSAT)

NOTE: DTC P0642/17026 is for Passat only.

NOTE: DTC P0601/16985, DTC P0602/16986, DTC P0604/16988, DTC P0606/16990 and DTC P0642/17026 may set if battery voltage (ECM voltage supply) is to low when vehicle is being started.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

2. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM, turn ignition off. ECM is located at left rear of engine compartment. Remove ECM protective cover and retaining bracket. See **Fig. 7** . Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.
4. After installing ECM perform following procedures:
    - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
    - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
    - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
    - On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
    - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
    - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
    - Perform idle check. See **IDLE CHECK** .
    - Generate ECM readiness code. See **READINESS CODE** .

P0650/17034: MIL (K83) - OBD ELECTRICAL CIRCUIT MALFUNCTION

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

With key in the on position, if MIL does not illuminate. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check MIL wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

If MIL is illuminated with engine running, turn engine off. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check MIL wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

DTC P0685/17069, DTC P0686/17070, DTC P0687/17071 & DTC P0688/17072

Code Definition

- DTC P0685/17069: Power Supply Relay (J271) - Open Circuit
- DTC P0686/17070: Power Supply Relay (J271) - Short Circuit To Ground
- DTC P0687/17071: Power Supply Relay (J271) - Short Circuit To B+
- DTC P0688/17072: Power Supply Relay (J271) - Open Load Circuit

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Using DVOM, check resistance of Power Supply Relay wiring. Power Supply Relay is located at left rear of engine compartment. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. If resistance is okay, replace faulty Power Supply Relay (J271). If resistance is not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

P0704/17088: CLUTCH VACUUM VENT SWITCH (F36) - IMPLAUSIBLE SIGNAL

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Clutch Vacuum Vent Switch (F36) for DTCs, this is done in display group 66 when using Scan Tool VAG 1551/1552 or VAS 5051/5052. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check Clutch Vacuum Vent Switch (F36). Remove trim to access clutch vacuum vent switch and disconnect clutch vacuum vent switch harness connector. Using DVOM check resistance at clutch vacuum vent switch, resistance should be approximately 0 ohms (closed circuit), depress clutch pedal, resistance should be infinite (open circuit). If Clutch Vacuum Vent Switch (F36) resistance readings are okay, go to next step. If Clutch Vacuum Vent Switch (F36) resistance readings are not okay, replace faulty Clutch Vacuum Vent Switch (F36). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

3. Using DVOM check Clutch Vacuum Vent Switch (F36) harness connector wiring resistance. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check Clutch Vacuum Vent Switch (F36) harness connector wiring for short circuit to one another, short circuit to ground, and short circuit to B+. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If Clutch Vacuum Vent Switch (F36) is okay and wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1102/17510 & DTC P1103/17511

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1102/17510: HO2 Sensor (G39) Upstream TWC - Heating Element Circuit Short To B+
- DTC P1103/17511: HO2 Sensor (G39) Upstream TWC - Heating Element Output Too Low

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 20** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go

to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 21** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 21** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0131/16515 & DTC P0132/16516 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 21** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1105/17513: HO2 SENSOR (G130) DOWNSTREAM TWC - HEATING CIRCUIT SHORT TO B+

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist.

Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (brown 4-pin), see **Fig. 19** . Go to next step.
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 22** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 23** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 23** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 23** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1111/17519 & DTC P1112/17520

Code Definition

- DTC P1111/17519: HO2 Sensor (G39) Control, Upstream TWC - System Too Lean
- DTC P1112/17520: HO2 Sensor (G39) Control, Upstream TWC - System Too Rich

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S G20 control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If HO2S heater is on, activation and readiness checks are okay. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .
3. **NOTE: Operating range of upstream HO2S is negative 25 to positive 25 percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to positive 10 percent specification is allowed to vary slightly.**

Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay and show a lean signal, go to step 6 . If learned values are not okay and show a rich signal, go to step 7 .

4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If downstream HO2S control is okay. Go to next step.
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve is not okay, repair as necessary. See **DTC P0440/16824 & DTC P0441/16825** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10.

NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.

Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

11. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 21** .

- Upstream HO2S connector terminal No. 1 and test box socket No. 70.
- Upstream HO2S connector terminal No. 2 and test box socket No. 71.
- Upstream HO2S connector terminal No. 5 and test box socket No. 51.
- Upstream HO2S connector terminal No. 6 and test box socket No. 52.

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1113/17521: HO2 SENSOR (G39) UPSTREAM TWC - INTERNAL RESISTANCE TOO HIGH

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 20** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 21** . Voltage should be 11.0-14.5 volts. If voltage is okay,

go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 21** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0131/16515 & DTC P0132/16516 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 21** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1114/17522: HO2 SENSOR (G130) DOWNSTREAM TWC - INTERNAL RESISTANCE TOO HIGH

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step.

If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (brown 4-pin), see **Fig. 19** . Go to next step.
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 22** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 23** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 23** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 23** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE**

RELEARN PROCEDURE . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1115/17523 & DTC P1116/17524

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1115/17523: HO2 Sensor (G39) Upstream TWC - Heating Circuit Short To Ground
- DTC P1116/17524: HO2 Sensor (G39) Upstream TWC - Heating Circuit Open

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 20** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 21** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should

be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 21** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0131/16515 & DTC P0132/16516 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 21** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1117/17525 & DTC P1118/17526

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1117/17525: HO2 Sensor (G130) Downstream TWC - Heating Circuit Short To Ground
- DTC P1118/17526: HO2 Sensor (G130) Downstream TWC - Heating Circuit Open

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect downstream HO2S (G130) harness connector (brown 4-pin), see **Fig. 19** . Go to next step.
4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 22** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 23** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 23** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 23** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC

memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1127/17535, DTC P1128/17536, DTC P1136/17544 & DTC P1137/17545

Code Definition

- DTC P1127/17535: HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Rich
- DTC P1128/17536: HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Lean
- DTC P1136/17544: HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Lean At Idle
- DTC P1137/17545: HO2 Sensor (G39) Upstream TWC - Long Term Fuel Trim Too Rich At Idle

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Check air induction, secondary air injection and exhaust system for leaks. Check air filter for blockage. If no air or exhaust leaks are found and air intake is unrestricted, go to next step. If air or exhaust leaks are found and/or air intake is restricted. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S G20 control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If HO2S heater is on, activation and readiness checks are okay. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .
3. **NOTE: Operating range of upstream HO2S is negative 25 to positive 25 percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to**

positive 10 percent specification is allowed to vary slightly.

Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay and show a lean signal, go to step 6 . If learned values are not okay and show a rich signal, go to step 7 .

4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If downstream HO2S control is okay. Go to next step.
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. See **DTC P0440/16824 & DTC P0441/16825** . If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. **NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.**

    Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
11. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect

Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 21** .

- Upstream HO2S connector terminal No. 1 and test box socket No. 70.
- Upstream HO2S connector terminal No. 2 and test box socket No. 71.
- Upstream HO2S connector terminal No. 5 and test box socket No. 51.
- Upstream HO2S connector terminal No. 6 and test box socket No. 52.

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1141/17549, DTC P1142/17550 & DTC P1143/17551

Code Definition

- DTC P1141/17549: Load Detection - Implausible Value
- DTC P1142/17550: Load Detection - Lower Limit Not Reached
- DTC P1143/17551: Load Detection - Upper Limit Exceeded

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure no exhaust system leaks exist. Engine coolant temperature is at least 176° F (80°C). On vehicles with M/T, gear shifter must be in neutral with parking brake set. On vehicles with A/T, selector lever must be in park or neutral with parking brake set.

Test Procedure

1. Inspect air induction system for leaks. Check air filter for blockage. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle. Using scan tool, check air mass drawn in by engine. Air mass should be 2.0-4.5 grams/second at idle. If air mass reading is okay, go to next step (voltage supply for MAF sensor must be checked). If air mass reading is not okay, go to step 6 .
3. Turn ignition off. Disconnect MAF sensor 5-pin connector. Using DVOM, measure voltage between MAF sensor 5-pin connector, terminal No. 2 and ground. See **Fig. 24** . Start engine and idle. Voltage should be 11-15 volts. If voltage is okay, go to step 5 . If voltage is not okay, go to next step.
4. Turn ignition off. Repair wiring from MAF sensor 5-pin connector, terminal No. 2 and fuel pump relay (J17). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn

procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. Turn ignition on. Using DVOM, check voltage between MAF sensor 5-pin connector, terminal No. 4 and ground. See **Fig. 24** . Voltage should be 4.5-5.5 volts. If voltage is okay, go to next step (further circuit tests are required). If voltage is not okay, go to next step.
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following MAF sensor (G70) connector terminals and test box sockets. See **Fig. 64** .
   - MAF sensor harness connector terminal No. 3 and test box socket No. 27.
   - MAF sensor harness connector terminal No. 4 and test box socket No. 53.
   - MAF sensor harness connector terminal No. 5 and test box socket No. 29.

   Resistance should be a maximum of 1.5 ohms for each reading. If resistance measurements are okay, go to next step. If any resistance measurement is not okay, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Using DVOM, check wiring in MAF sensor 5-pin connector for short circuit to one another, short circuit to ground, or short circuit to B+. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If circuits are okay, go to next step.
8. Check Throttle Valve Control Module (TVCM - J338). See **DTC P1171/17579, DTC P1172/17580 & DTC P1173/17581** .
9. Check Accelerator Pedal Position Sensors (APPS 1 - G79) and (APPS 2 -G185). See **DTC P1630/18038, DTC P1631/18039, DTC P1633/18041 & DTC P1634/18042** .
10. If TVCM - J338, APPS 1 - G79 and APPS 2 - G185, voltage checks, wiring and grounds are okay and DTC P1141/17549, DTC P1142/17550 or DTC P1143/17551 return, replace faulty MAF sensor (G70). After repairs, erase DTC memory. Verify Repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

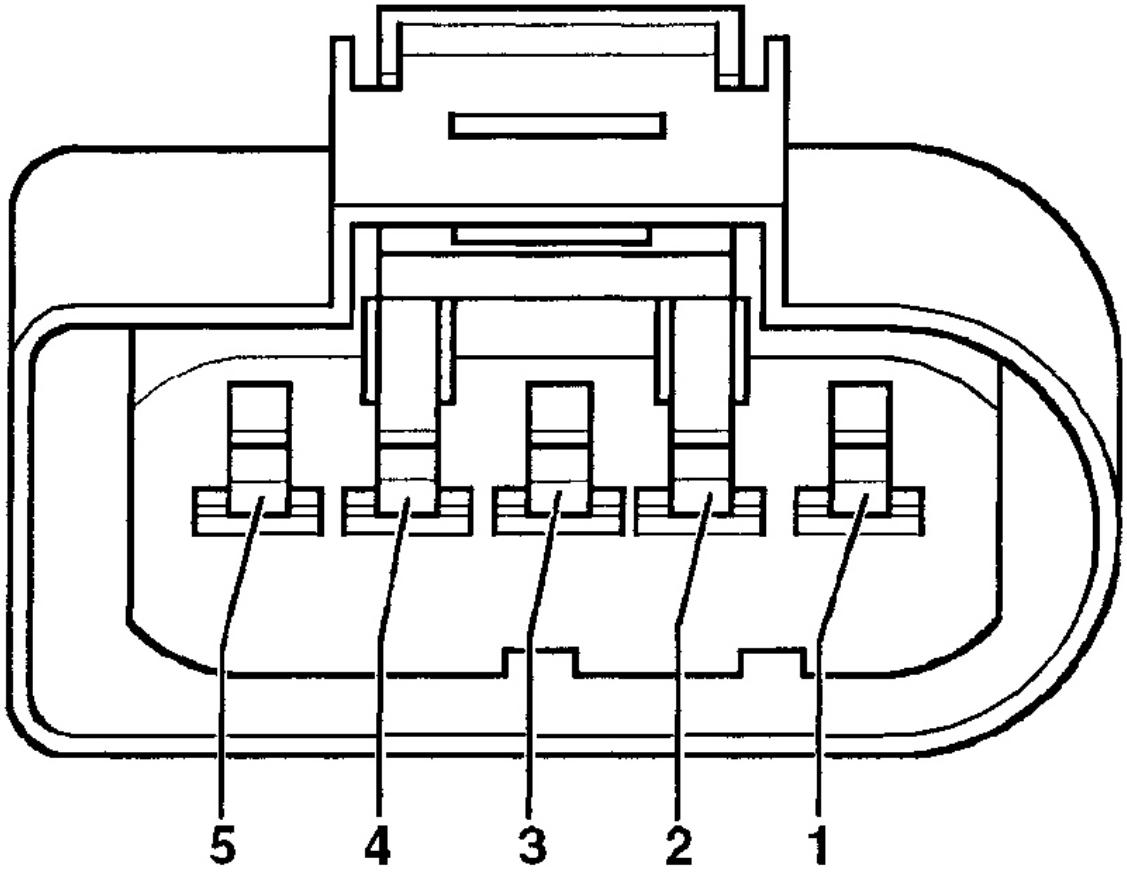


Fig. 64: Identifying Mass Airflow Sensor (G70) Harness Connector Terminals
Courtesy of AUDI OF AMERICA, INC.

DTC P1149: HO2 SENSOR (G39) UPSTREAM TWC - IMPLAUSIBLE SIGNAL

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. Check air filter for blockage. If no air leaks are found and air flow is unrestricted, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: Upstream HO2S (G39) control signal activation may only occur above 1500 RPM.**

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S G20 control signal activation. HO2S control signal should be activated. Use scan tool to check upstream HO2S readiness. HO2S should be operationally ready. Observe scan tool in upstream HO2S heater activation test mode. Heater should be on. If HO2S heater is on, activation and readiness checks are okay. Go to next step (further testing is needed). If HO2S heater is off, or if HO2S activation or readiness checks are not okay, check HO2S heater. See **DTC P0130/16514 & DTC P0135/16519** .

3.

NOTE: Operating range of upstream HO2S is negative 25 to positive 25 percent when using Scan Tool VAG 1551/1552 or VAS 5051. Specified range of upstream HO2S is negative 10 to positive 10 percent when using Scan Tool VAG 1551/1552 or VAS 5051. In testing procedures negative 10 to positive 10 percent specification is allowed to vary slightly.

Using scan tool, check upstream HO2S learned values at idle and part throttle. Learned values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle. If learned values are okay, go to next step. If learned values are not okay and show a lean signal, go to step 6 . If learned values are not okay and show a rich signal, go to step 7 .

4. Using scan tool, check upstream HO2S control signal switching. Values should be negative 10 to positive 10 percent (0.3 to 0.7 volt) at idle and part throttle and must switch a minimum of 2 percent (0.1 volt). If test values are not as specified and faulty wiring is suspected, go to step 11 . If test values are not as specified and wiring is not suspect, go to next step. If test values are okay, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test values are okay after test drive, go to next step. If test values are not okay after test drive, replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Check downstream HO2S control. See **DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522** . If downstream HO2S control is okay. Go to next step.
7. Check for gasoline fouled engine oil. Change engine oil as necessary. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Check to see if EVAP canister purge valve (N80) is stuck in the open position. If EVAP canister purge valve is okay go to next step. If EVAP canister purge valve is not okay, repair as necessary. See **DTC P0440/16824 & DTC P0441/16825** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10.

NOTE: If MAF sensor (G70) malfunctions, a DTC for MAF sensor should be present in ECM memory.

Check MAF sensor (G70). See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

11. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
12. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following upstream HO2S connector terminals and test box sockets. See **Fig. 21** .
    - Upstream HO2S connector terminal No. 1 and test box socket No. 70.
    - Upstream HO2S connector terminal No. 2 and test box socket No. 71.
    - Upstream HO2S connector terminal No. 5 and test box socket No. 51.
    - Upstream HO2S connector terminal No. 6 and test box socket No. 52.

    Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in upstream HO2S 6-pin harness connector for short circuits to one another. If resistance measurements are okay and no short circuits exist. Replace upstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1171/17579, DTC P1172/17580 & DTC P1173/17581

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1171/17579: Angle Sensor 2 (G188) For Throttle Valve Drive - Implausible Signal
- DTC P1172/17580: Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too Low
- DTC P1173/17581: Angle Sensor 2 (G188) For Throttle Valve Drive - Signal Too High

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle

valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

   NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).

2. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.

5. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118
6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE**

RELEARN PROCEDURE .

DTC P1176: HO2 SENSOR (G39) CORRECTION UPSTREAM TWC, HO2 SENSOR (G130) DOWNSTREAM TWC - CONTROL LIMIT REACHED (AGING)

NOTE: This procedure applies to engine code AWV and AWM only.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. Using generic scan tool, following scan tool manufacturer's instructions, check aging of upstream HO2S.
4. **NOTE: Catalytic converter must be 662° F (350° C) to 932° F (500° C) for scan tool to switch from "Test off" to "Test on".**

   NOTE: For engine code AWM go to step 5 .

   Engine Code AWV - This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 34". Using accelerator pedal prop manually set engine speed to 1800-2200 RPM. Maintain engine speed of 1800 to 2200 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 1800 to 2200 RPM until scan tool displays specification "B1-S1 OK". If scan tool does not display "B1-S1 OK", go to step 6 . If scan tool displays "B1-S1 OK", erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. **Engine Code AWM -** This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "system in basic setting 34". Using accelerator pedal prop manually set engine speed to 2300-2500 RPM. Maintain engine speed of 2300 to 2500 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 2300 to 2500 RPM until scan tool displays specification "B1-S1 OK". If scan tool does not display "B1-S1 OK", go to next step. If scan tool displays "B1-S1 OK", erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC

memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

NOTE: If this test procedure did not find a fault, see test procedure DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 .

DTC P1176: HO2 SENSOR (G39) CORRECTION UPSTREAM TWC, HO2 SENSOR (G130) DOWNSTREAM TWC - CONTROL LIMIT REACHED (AGING)

NOTE: This procedure applies to engine code AWP only.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. Using generic scan tool, following scan tool manufacturer's instructions, check aging of upstream HO2S.
4. **NOTE: Catalytic converter must be 662-932°F (350-500°C) for scan tool to switch from "Test off" to "Test on".**

   This test requires using Scan Tool VAG 1551/1552 or VAS 5051/5052. For A/T put vehicle gear selector lever in park. For M/T put vehicle gear shift lever in neutral. Apply parking brake. Start engine and idle. Using Scan Tool VAG 1551/1552 or VAS 5051/5052, go to "Display group 34". Depress brake pedal and hold. Press accelerator pedal to wide open throttle position. Engine speed is increased by ECM 1800 to 2200 RPM. Maintain engine speed of 1800 to 2200 RPM until scan tool display jumps from "Test off" to "Test on". Continue to maintain engine speed of 1800 to 2200 RPM until scan tool displays specification "B1-S1 OK". If scan tool does not display "B1-S1 OK", go to next step. If scan tool displays "B1-S1 OK", erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Test drive vehicle (to burn HO2S clean) and retest system. If test is okay after test drive, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If test is not okay after test drive, replace downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

NOTE: **If this test procedure did not find a fault, see test procedure DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 .**

DTC P1196/17604: HO2 SENSOR (G39) UPSTREAM TWC - ELECTRICAL MALFUNCTION

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

NOTE: **DTC P1196/17604 applies to Beetle only (engine code AWV).**

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check upstream HO2S (G39) heater activation. Observe scan tool in upstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. Raise vehicle and remove HO2 sensors protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.
4. Using DVOM check resistance of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S. See **Fig. 20** . Resistance should be 2.5-10 ohms at room temperature. If resistance is okay, go to next step. If resistance is not okay, replace faulty HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminals No. 3 of HO2S harness connector and ground. See **Fig. 21** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 3 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 3 and 4 of HO2S harness connector. See **Fig. 21** . Reconnect scan tool. Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G39)

heater activation. Observe scan tool in upstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7.

NOTE: Before replacing ECM check HO2S control signal. See DTC P0131/16515 & DTC P0132/16516 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.

Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 4 and test box socket No. 5. See **Fig. 21** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1198/17606: HO2 SENSOR (G130) DOWNSTREAM TWC - HEATING CIRCUIT MALFUNCTION

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check air induction and secondary air injection system for leaks. If no air leaks are found, go to next step. If air leaks are found. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle for two minutes. Following scan tool manufacturer's instructions, use scan tool to check downstream HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater activation test mode. Heater actuation must switch, alternating from on to off. If HO2S heater remains in off mode, go to next step. If HO2S heater switches, alternating from on to off, go to next step, (further testing is needed).
3. Turn ignition off. For Passat, see **Fig. 18** . For all other models. Raise vehicle and remove HO2 sensors

protective cover and disconnect upstream HO2S (G39) harness connector (black 6-pin), see **Fig. 19** . Go to next step.

4. **NOTE: No resistance specification for HO2S heater circuit is given by manufacturer.**

   Using DVOM check heater circuit on HO2S for continuity. Connect DVOM between terminals No. 1 and 2 of HO2S. See **Fig. 22** . HO2S heater circuit should have continuity. If HO2S heater circuit has continuity, go to next step. If HO2S heater circuit is open, replace faulty downstream HO2S. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. Start engine and idle. Check voltage supply to HO2S heater. Connect DVOM between terminal No. 1 of HO2S harness connector and ground. See **Fig. 23** . Voltage should be 11.0-14.5 volts. If voltage is okay, go to next step. If voltage is not okay. Turn ignition off. Using DVOM check resistance of HO2S harness connector terminal No. 1 to fuel pump relay (J17) harness connector, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Using DVOM and scan tool, check activation and voltage of heater circuit on HO2S. Connect DVOM between terminals No. 1 and 2 of HO2S harness connector. See **Fig. 23** . Reconnect scan tool (if removed). Start engine and idle. Following scan tool manufacturer's instructions, use scan tool to check HO2S (G130) heater activation. Observe scan tool in downstream HO2S heater circuit activation mode. Observe voltage on DVOM. When scan tool shows heater circuit activation On, voltage should be 11.5-14.5 volts. When scan tool shows heater circuit activation alternating from On to Off, voltage should alternate from 0-12 volts. Turn ignition off. If voltage and/or activation is not okay, go to next step. If voltage and activation are okay. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. **NOTE: Before replacing ECM check HO2S control signal. See DTC P0136/16520, DTC P0137/16521 & DTC P0138/16522 . If HO2S signal is not within specifications it may set a DTC for HO2S heater malfunction.**

   Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between HO2S harness connector No. 2 and test box socket No. 63. See **Fig. 23** . Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay, and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1200/17608: RECIRCULATING VALVE FOR TURBOCHARGER (N249) - MECHANICAL MALFUNCTION

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirement

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Recirculating Valve (N249)

Turn ignition off. Disconnect harness connector from recirculating valve. See **COMPONENT LOCATIONS** . Measure resistance between terminals on recirculating valve. For resistance specifications, see **RECIRCULATING VALVE (N249) RESISTANCE** table. Replace as necessary. Verify repair. Test is complete.

RECIRCULATING VALVE (N249) RESISTANCE

Model	Ohms
Beetle (APH & AWV)	21-24
Beetle (AWP), Golf, GTI & Jetta	27-30
Passat	25-35

1. **NOTE: When using scan tool to activate recirculating valve (N249), it is barely audible, check by touch or use mechanics stethoscope if necessary.**

   Connect scan tool. Turn ignition on, engine off. Using scan tool, activate recirculating valve. See **OUTPUT DIAGNOSTIC TEST MODE** . Recirculating valve should audibly click. If recirculating valve clicks. Test is complete. If recirculating valve does not click, go to next step.
2. Disconnect recirculating valve harness connector. See **COMPONENT LOCATIONS** . Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to recirculating valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of recirculating valve. Turn ignition off. Replace faulty recirculating valve. After repairs, erase DTC memory. Verify repair. Test is complete.
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, measure resistance between recirculating valve harness connector terminal No. 2 and test box socket No. 105. See **Fig. 17** . Record resistance reading. Resistance should be a maximum of 1.5 ohms. Check terminal No. 2 of recirculating valve harness connector for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete.
4. Using DVOM, check resistance between recirculating valve harness connector terminal No. 1 and fuel

pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. Verify repair. Test is complete. If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1201/17609, DTC P1202/17610, DTC P1203/17611 & DTC P1204/17612

Code Definition

- DTC P1201/17609: Injector Cylinder 1 (N30) - Electrical Malfunction
- DTC P1202/17610: Injector Cylinder 2 (N31) - Electrical Malfunction
- DTC P1203/17611: Injector Cylinder 3 (N32) - Electrical Malfunction
- DTC P1204/17612: Injector Cylinder 4 (N33) - Electrical Malfunction

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary. Beetle (engine code AWV) does not have an Output Diagnostic Test Mode for activating fuel injectors.

1. For Beetle (engine code AWV), go to next step. For all models except Beetle (engine code AWV). Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 35** . Resistance must be 12-17 ohms at room temperature, (resistance should be greater than 12-17 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

3.

NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors.

Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 36** and **Fig. 65** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .

4. Check resistance between fuel injector harness connector terminal No. 1 that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary.

5.

NOTE: Test light may not go out completely, but should dull and get brighter during activation.

With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .

6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 36** and **Fig. 65** .

FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

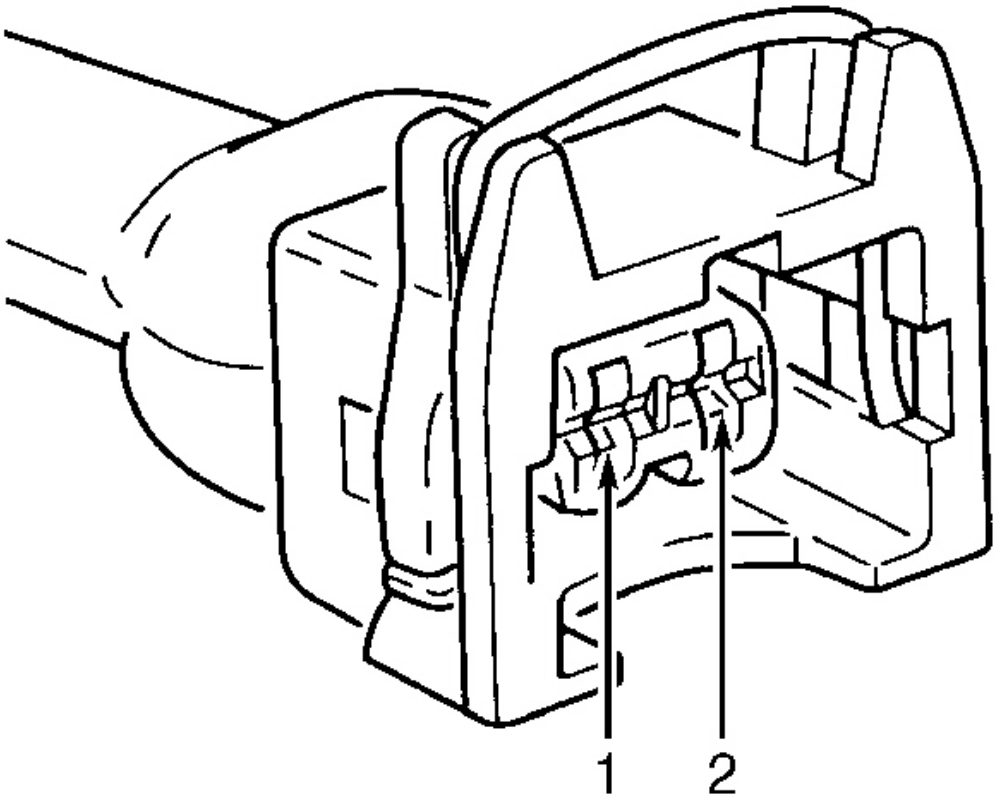


Fig. 65: Identifying Fuel Injector Harness Connector Terminals (Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1213/17621, DTC P1214/17622, DTC P1215/17623 & DTC P1216/17624

Code Definition

- DTC P1213/17621: Injector Cylinder 1 (N30) - Short To B+
- DTC P1214/17622: Injector Cylinder 2 (N31) - Short To B+
- DTC P1215/17623: Injector Cylinder 3 (N32) - Short To B+
- DTC P1216/17624: Injector Cylinder 4 (N33) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary. Beetle (engine code AWV) does not have an Output Diagnostic Test Mode for activating fuel injectors.

1. For Beetle (engine code AWV), go to next step. For all models except Beetle (engine code AWV). Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 35** . Resistance must be 12-17 ohms at room temperature, (resistance should be greater than 12-17 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 36** and **Fig. 17** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness

connectors disconnected and go to step 5 .

4. Check resistance between fuel injector harness connector terminal No. 1 that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary.
5. **NOTE: Test light may not go out completely, but should dull and get brighter during activation.**

   With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 36** and **Fig. 65** .

   FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

   Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1225/17633, DTC P1226/17634, DTC P1227/17635 & DTC P1228/17636

Code Definition

- DTC P1225/17633: Injector Cylinder 1 (N30) - Short To Ground
- DTC P1226/17634: Injector Cylinder 2 (N31) - Short To Ground
- DTC P1227/17635: Injector Cylinder 3 (N32) - Short To Ground
- DTC P1228/17636: Injector Cylinder 4 (N33) - Short To Ground

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary. Beetle (engine code AWV) does not have an Output Diagnostic Test Mode for activating fuel injectors.

1. For Beetle (engine code AWV), go to next step. For all models except Beetle (engine code AWV). Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 35** . Resistance must be 12-17 ohms at room temperature, (resistance should be greater than 12-17 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector harness connectors installed on fuel injectors.**

   Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 36** and **Fig. 65** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector.

If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .

4. Check resistance between fuel injector harness connector terminal No. 1 that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary.
5. **NOTE: Test light may not go out completely, but should dull and get brighter during activation.**

   With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 36** and **Fig. 65** .

FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. See **ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any

fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1237/17645, DTC P1238/17646, DTC P1239/17647 & DTC P1240/17648

Code Definition

- DTC P1237/17645: Injector Cylinder 1 (N30) - Open Circuit
- DTC P1238/17646: Injector Cylinder 2 (N31) - Open Circuit
- DTC P1239/17647: Injector Cylinder 3 (N32) - Open Circuit
- DTC P1240/17648: Injector Cylinder 4 (N33) - Open Circuit

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate fuel injectors, they are barely audible. Use mechanics stethoscope if necessary. Beetle (engine code AWV) does not have an Output Diagnostic Test Mode for activating fuel injectors.

1. For Beetle (engine code AWV), go to next step. For all models except Beetle (engine code AWV). Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Using scan tool, check activation of fuel injectors. See **OUTPUT DIAGNOSTIC TEST MODE** . All fuel injectors should audibly click. If any fuel injector does not click, go to next step. If all fuel injectors click, go to step 7 .
2. Turn ignition off. Disconnect fuel injector harness connectors. Using DVOM, measure resistance between fuel injector terminals. See **Fig. 35** . Resistance must be 12-17 ohms at room temperature, (resistance should be greater than 12-17 ohms at engine operating temperature). If fuel injector resistance is okay, leave fuel injector harness connectors disconnected and go to next step. If fuel injector resistance is not okay, replace faulty fuel injector(s). See FUEL SYSTEM in appropriate REMOVAL, OVERHAUL & INSTALLATION article. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: DO NOT check fuel injector voltage with engine running or fuel injector**

harness connectors installed on fuel injectors.

Turn ignition on. Using LED equipped test light connected to engine ground and with all fuel injector harness connectors disconnected, probe each fuel injector harness connector terminal No. 1. See **Fig. 36** and **Fig. 65** . Using ignition switch, operate starter, LED must illuminate. Repeat test at each fuel injector. If test light does not illuminate at each fuel injector harness connector terminal No. 1, go to next step. If test light illuminates at each fuel injector harness connector terminal No. 1, leave fuel injector harness connectors disconnected and go to step 5 .

4. Check resistance between fuel injector harness connector terminal No. 1 that does not illuminate and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary.
5. **NOTE: Test light may not go out completely, but should dull and get brighter during activation.**

   With all fuel injector harness connectors disconnected, connect LED equipped test light between fuel injector harness connector terminals No. 1 and 2. Using ignition switch, operate starter. Test light should flash. Repeat test at all fuel injector harness connectors. If LED test light does not flash at all fuel injector harness connectors, go to next step. If LED test light flashes at all fuel injector harness connectors, go to step 7 .
6. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following fuel injector harness connector and VAG test box socket. See **FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 36** and **Fig. 65** .

FUEL INJECTOR HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

Cylinder	Fuel Injector Harness Connector Terminal	VAG Test Box Socket
1	2	96
2	2	89
3	2	97
4	2	88

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in fuel injector pin harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace ECM. See **ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Check fuel pressure and fuel pressure regulator. See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel pressure is okay, go to next step. If fuel pressure is not okay,

Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

8. Check fuel injector volume (possible blocked or leaking injector). See FUEL SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article. If fuel injector volume is okay, and fuel injectors do not leak more than 2 drops per minute each, go to next step. If fuel injector volume is not okay and /or any fuel injectors leak more than 2 drops per minute each, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1250/17658: FUEL LEVEL TOO LOW

NOTE: DTC P1250/17658 is stored by ECM until it is erased using scan tool, when DTC P1250/17658 is stored by ECM other codes may have also have set at the same time, (e.g. misfire or system to lean).

1. Check fuel level. If fuel level is less than 2 gallons, fill fuel tank, erase DTC memory. If DTC P1250/17658 resets, go to next step. If DTC P1250/17658 does not reset, test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check fuel gauge and fuel gauge sender operation. If fuel gauge and/or fuel gauge sender are not operating properly, repair fuel gauge and/or fuel gauge sender as necessary. See appropriate INSTRUMENT PANELS article in ACCESSORIES & EQUIPMENT. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1287/17695, DTC P1288/17696 & DTC P1289/17697

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1287/17695: Recirculating Valve For Turbocharger (N249) - Open Circuit
- DTC P1288/17696: Recirculating Valve For Turbocharger (N249) - Short To B+
- DTC P1289/17697: Recirculating Valve For Turbocharger (N249) - Short To Ground

Test Requirement

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

Turn ignition off. Disconnect harness connector from recirculating valve. See **COMPONENT LOCATIONS** . Measure resistance between terminals on recirculating valve. For resistance specifications, see **RECIRCULATING VALVE (N249) RESISTANCE** table. If resistance is okay, go to next step. If resistance is not okay, replace faulty Recirculating Valve (N249). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

RECIRCULATING VALVE (N249) RESISTANCE

Model	Ohms
Beetle (APH & AWV)	21-24
Beetle (AWP), Golf, GTI & Jetta	27-30
Passat	25-35

1. **NOTE: When using scan tool to activate recirculating valve (N249), it is barely audible, check by touch or use mechanics stethoscope if necessary.**

   Connect scan tool. Turn ignition on, engine off. Using scan tool, activate recirculating valve. See **OUTPUT DIAGNOSTIC TEST MODE** . Recirculating valve should audibly click. If recirculating valve clicks. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Test is complete. If recirculating valve does not click, go to next step.
2. Disconnect recirculating valve harness connector. See **COMPONENT LOCATIONS** . Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to recirculating valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of recirculating valve. Turn ignition off. Replace faulty recirculating valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, measure resistance between recirculating valve harness connector terminal No. 2 and test box socket No. 105. See **Fig. 17** . Record resistance reading. Resistance should be a maximum of 1.5 ohms. Check terminal No. 2 of recirculating valve harness connector for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Using DVOM, check resistance between recirculating valve harness connector terminal No. 1 and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See

TEST DRIVE RELEARN PROCEDURE . If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1295/17703: WASTEGATE BY-PASS REGULATOR VALVE (N75) - MALFUNCTION

NOTE: When using scan tool to activate wastegate by-pass regulator valve, it is barely audible, check by touch or use mechanics stethoscope if necessary.

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Turn ignition off. Locate wastegate by-pass regulator valve. See **COMPONENT LOCATIONS** . Check hoses to wastegate by-pass regulator valve (N75). If hoses are okay, go to next step. If hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Disconnect wastegate by-pass regulator harness connector. Measure resistance between valve terminals. See **Fig. 39** or **Fig. 40** . If resistance is between 25-35 ohms, go to next step. If resistance is not 25-35 ohms, replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Connect Scan Tool. Turn ignition on, engine off. Using scan tool, activate wastegate by-pass regulator valve. Wastegate by-pass regulator valve should audibly click. If wastegate by-pass regulator valve clicks. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wastegate by-pass regulator valve does not click, go to next step.
4. Disconnect wastegate by-pass regulator valve harness connector. See **COMPONENT LOCATIONS** . Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to wastegate by-pass regulator valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of wastegate by-pass regulator valve. Turn ignition off. Replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, measure resistance between wastegate by-pass regulator valve harness connector terminal No. 2 and test box socket No. 104. See **Fig. 17** . Record resistance reading. Resistance should be a maximum of

1.5 ohms. Check terminal No. 2 of wastegate by-pass regulator valve harness connector for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Using DVOM, check resistance between wastegate by-pass regulator valve harness connector terminal No. 1 and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. Verify repair. Test is complete. If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1296/17704: MALFUNCTION IN COOLING SYSTEM

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: Engine must be cold before performing test procedure.

NOTE: To bleed cooling system, fill cooling system. Warm engine to operating temperature, (run engine until coolant fan starts), do not allow engine to overheat, let engine cool and recheck coolant level.

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant system and engine coolant system thermostat are in good working order.

Test Procedure (Beetle - Engine Code AWV)

1. Disconnect ECT sensor harness connector. See **Fig. 26** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals No. 1 and 3. See **Fig. 27** . See **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check cooling system thermostat and cooling system. See appropriate COOLING SYSTEMS article. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Connect scan tool. See **RETRIEVING CODES** . Turn ignition on. Using scan tool, check ECT sensor

temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 5 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.

4.

NOTE: Next test step tests ECT sensor through its full range.

NOTE: Scan Tool (VAG 1551) and (VAG 1552) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 7 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
6. Disconnect ECT sensor harness connector. See **Fig. 26** . Using a jumper wire, bridge terminal with Brown/Blue wire and terminal No. 3 of ECT sensor harness connector. See **Fig. 28** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 8 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect ECT sensor harness connector. See **Fig. 26** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor harness connector. See **Fig. 26** . Using DVOM, measure resistance between ECT sensor harness connector terminal with Brown/Blue wire and test box socket No. 108. See **Fig. 28** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 3 and test box socket No. 93. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
9. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 108. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive and ground. Check Brown/Blue wire on ECT sensor harness connector for short circuit to B+. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN**

PROCEDURE .

Test Procedure (Beetle, GTI & Jetta - Engine Code AWP)

NOTE: Engine must be cold before performing test procedure.

1. Disconnect ECT sensor harness connector. See **Fig. 29** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals "C" and "D". See **Fig. 30** and **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551/1552) and (VAS 5051/5052) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 29** . Using a jumper wire, bridge terminal with Brown/Blue wire and terminal No. 3 of ECT sensor harness connector. See **Fig. 32** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Disconnect ECT sensor harness connector. See **Fig. 29** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG

1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor 4-pin connector. See **Fig. 29** . Using DVOM, measure resistance between ECT sensor harness connector terminal with No. 3 and test box socket No. 93. See **Fig. 32** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 4 and test box socket No. 108. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.

8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 108. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive and ground. Check ECT sensor harness connector terminal No. 4 for short circuit to battery positive. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure (Passat)

NOTE: Engine must be cold before performing test procedure.

1. Disconnect ECT sensor harness connector. See **Fig. 31** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals "C" and "D". See **Fig. 30** . See **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551) and (VAG 1552) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See TEST DRIVE RELEARN PROCEDURE .

   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 31** . Using a jumper wire, bridge terminals No. 3 and

4 of ECT sensor harness connector. See **Fig. 32** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Disconnect ECT sensor harness connector. See **Fig. 31** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor harness connector. See **Fig. 31** . Using DVOM, measure resistance between ECT sensor harness connector terminal with No. 3 and test box socket No. 108. See **Fig. 32** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 4 and test box socket No. 93. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 93. Check ECT sensor harness connector terminal No. 4 for short circuit to battery positive and ground. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

ECT SENSOR (G62) RESISTANCE

Temperature °F (°C)	Ohms
86 (30)	1500-2000
104 (40)	1000-1500
122 (50)	800-1000
140 (60)	500-700
158 (70)	375-500
176 (80)	275-375
194 (90)	225-275

DTC P1297/17705: TURBOCHARGER TO THROTTLE VALVE CONNECTION - PRESSURE LOSS

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

Check hoses between turbocharger and throttle body. If hoses between turbocharger and throttle body are found to be loose, check all turbocharger hoses and clamps for tightness, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1325/17733, DTC P1326/17734, DTC P1327/17735 & DTC P1328/17736

NOTE: Following procedure applies to for all models except Passat.

Code Definition

- DTC P1325/17733: Knock Control, Cylinder 1 - Limit Reached
- DTC P1326/17734: Knock Control, Cylinder 2 - Limit Reached
- DTC P1327/17735: Knock Control, Cylinder 3 - Limit Reached
- DTC P1328/17736: Knock Control, Cylinder 4 - Limit Reached

NOTE: To ensure knock sensors perform perfectly, it is extremely important that knock sensors are tightened to 15 ft. lbs.(20 Nm). Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

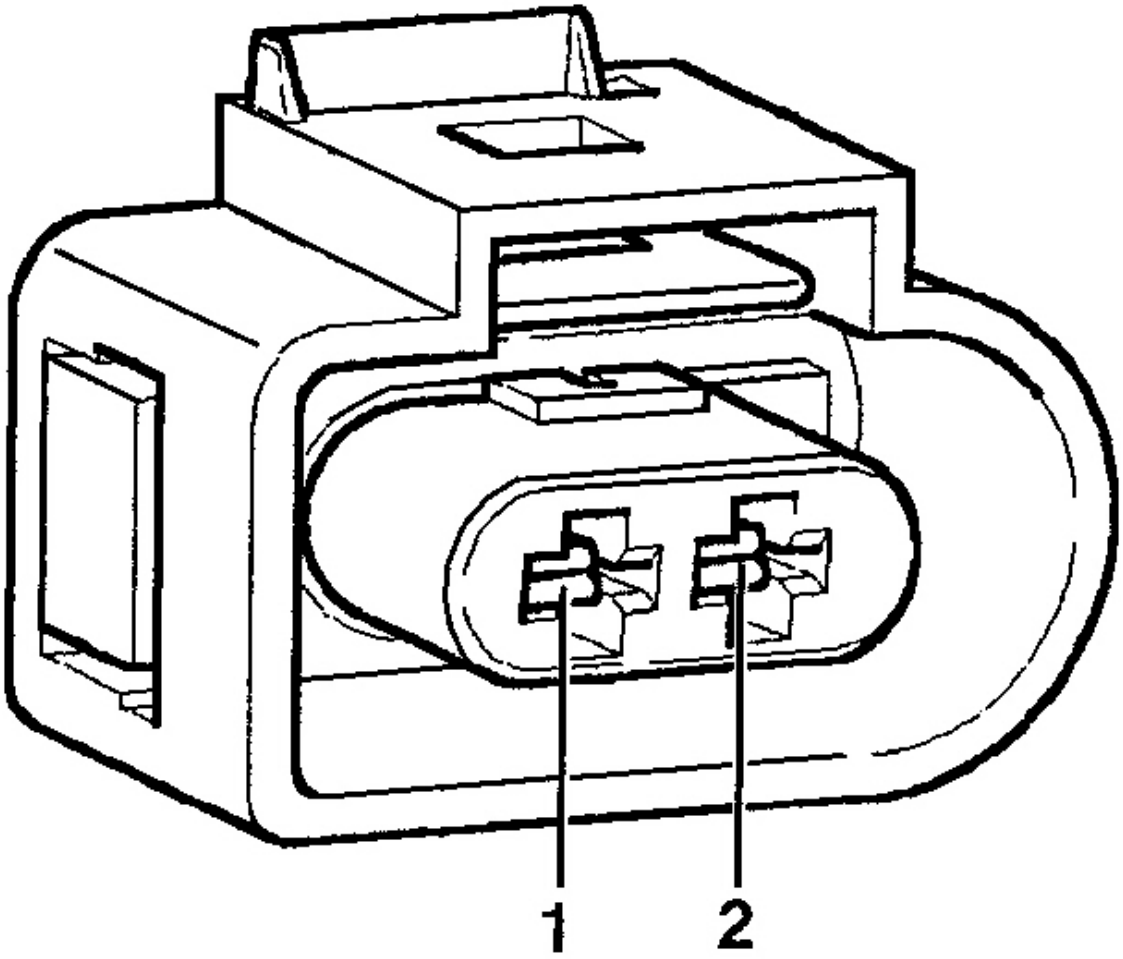
1. Fill fuel tank with 91 RON gasoline. Check knock sensor harness connectors for corrosion, damage and proper installation. Loosen knock sensors and tighten to 15 ft. lbs. (20 Nm). Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
2. Check engine for mechanical noise, repair as necessary. If no mechanical noise is found, go to next step. If repairs were made and mechanical noise eliminated, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
3. Turn ignition off. Disconnect knock sensor No. 1 and 2 harness connectors. Check resistance between contacts at each knock sensor, resistance should be infinite (no continuity). If no continuity is present in resistance reading, go to next step. If continuity is present in resistance reading, replace faulty knock sensor(s). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following knock sensor harness connectors and VAG test box

sockets. Check wiring for short circuit to one another in Knock sensor No. 1 (G61) harness connector. Check wiring for short circuit to one another in Knock sensor No. 2 (G66) harness connector. See **KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 17** and **Fig. 66** . Resistance should be a maximum of 1.5 ohms. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Knock Sensor Harness Connector Terminal	VAG Test Box Socket
Knock Sensor No. 1 (G61 - Cylinders 1/2)	
1 (Signal)	106
2 (Ground)	99
Knock Sensor No. 2 (G66 - Cylinders 3/4)	
1 (Signal)	107
2 (Ground)	99

5. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) reset, replace faulty knock sensor(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00073508

Fig. 66: Identifying Knock Sensor Harness Connector Test Points (Beetle - Engine Code AWP, GTI & Jetta
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1325/17733, DTC P1326/17734, DTC P1327/17735 & DTC P1328/17736 (PASSAT)

NOTE: Following procedure applies to Passat only.

Code Definition

- DTC P1325/17733: Knock Control, Cylinder 1 - Limit Reached
- DTC P1326/17734: Knock Control, Cylinder 2 - Limit Reached
- DTC P1327/17735: Knock Control, Cylinder 3 - Limit Reached
- DTC P1328/17736: Knock Control, Cylinder 4 - Limit Reached

NOTE: It is extremely important that knock sensors are tightened to 15 ft. lbs.(20 Nm),

to ensure knock sensors perform properly. Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Turn ignition off. Disconnect knock sensor No. 1 and 2 harness connectors, located at back of coolant reservoir. See **Fig. 67** . Check resistance between contacts No. 1 and 2, No. 1 and 3 and also No. 2 and 3 at each knock sensor, resistance should be infinite (no continuity). If no continuity is present in resistance readings, go to next step. If continuity is present in any resistance reading, replace faulty knock sensor(s). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Turn ignition off. Loosen and retighten knock sensors No. 1 and 2 to 15 ft. lbs.(20 Nm). Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) do not reset, test is complete. If DTC(s) resets, go to next step.
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following knock sensor harness connectors and VAG test box sockets. See **KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table. See **Fig. 67** . Resistance should be a maximum of 1.5 ohms for each reading. Check wiring for short circuit to one another in Knock sensor No. 1 (G61) harness connector. Check wiring for short circuit to one another in Knock sensor No. 2 (G66) harness connector. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

KNOCK SENSOR HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Knock Sensor Harness Connector Terminal	VAG Test Box Socket
Knock Sensor No. 1 (G61 - Cylinders 1 & 2)	
1 (Signal)	106
2 (Ground)	99
3 (Wire Shielding)	108
Knock Sensor No. 2 (G66 - Cylinders 3 & 4)	
1 (Signal)	107
2 (Ground)	99
3 (Wire Shielding)	108

4. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC(s) reset, replace faulty knock sensor(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

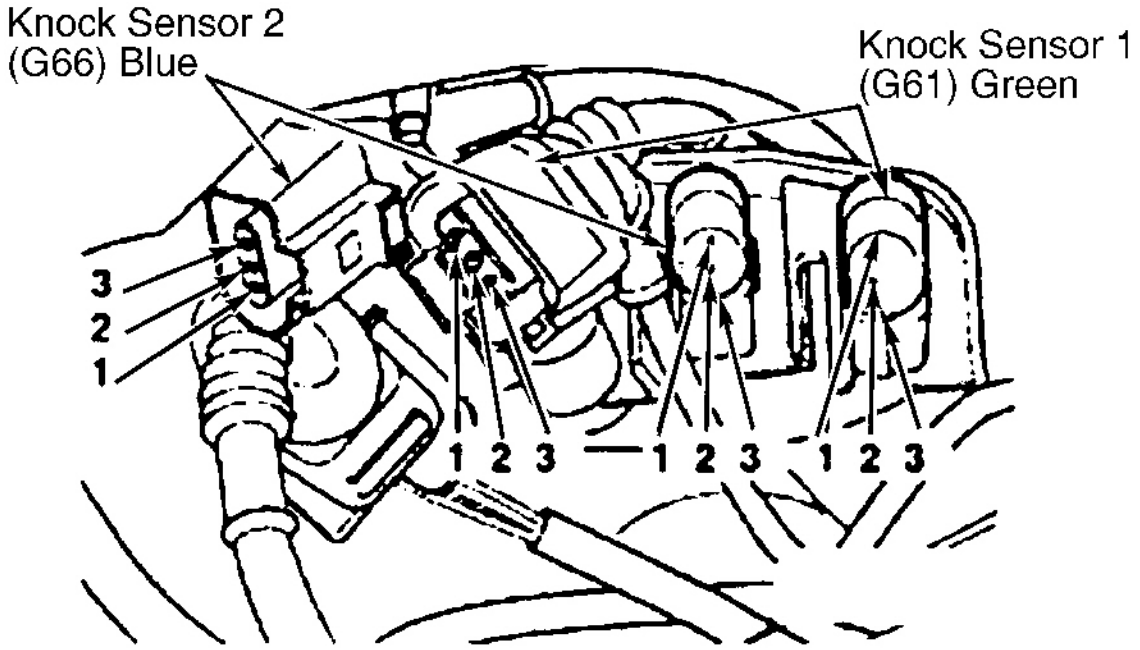


Fig. 67: Identifying Knock Sensor & Harness Connector Test Points (Passat)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1335/17743 & DTC P1336/17744

Code Definition

- DTC P1335/17743: Engine Torque Monitoring 2 - Control Limit Exceeded
- DTC P1336/17744: Engine Torque Monitoring - Control Limit Exceeded

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Turn engine off. Check turbocharger system pipes and hoses for damage and lose fit, repair as necessary. If turbocharger pipes and hoses are okay, go to next step. If repair(s) where made to turbocharger system, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check IAT sensor. See **DTC P0112/16496 & DTC P0113/16497** . If IAT sensor is okay, go to next step. If IAT sensor is not okay, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check MAF sensor. See **DTC P0101/16485, DTC P0102/16486 & DTC P0103/16487** . If MAF sensor is okay, go to next step. If MAF sensor is not okay, repair as necessary, erase DTC memory. Verify

repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. Check ECT sensor. See **DTC P1620/18028, DTC P1621/18029 & DTC P1622/18030** . If ECT sensor is not okay, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1337/17745: Camshaft Position Sensor (G163) - Open Circuit/Short To Ground
- DTC P1338/17746: Camshaft Position Sensor (G163) - Open Circuit/Short To B+
- DTC P1340/17748: Camshaft Position Sensor (G163) - Engine Speed (RPM) Sensor (G28), Incorrect Allocation

Test Requirement

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C). Ensure Camshaft Position (CMP) sensor is bolted on tightly.

Test Procedure

NOTE: Manufacturer's alpha-numeric identification for CMP sensor for Beetle (engine codes APH and AWV) is (G40), for all other 1.8L turbo models it is (G163).

NOTE: For DTC P1340/17748, see step 4 .

1. Disconnect CMP sensor 3-pin harness connector. See **Fig. 48** . Turn ignition on. Using DVOM measure voltage between terminals No. 1 and 3 of CMP sensor 3-pin harness connector. See **Fig. 49** or **Fig. 50** . Voltage should be a minimum of 4.5 volts. Turn ignition off. If readings are okay, go to next step. If readings are not okay, go to next step.
2. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following CMP sensor harness connector terminals and test box sockets. See **Fig. 49** or **Fig. 50** .
    - CMP sensor harness connector terminal No. 1 and test box socket No. 98.
    - CMP sensor harness connector terminal No. 2 and test box socket No. 86.

- CMP sensor harness connector terminal No. 3 and test box socket No. 108.

Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in CMP sensor 3-pin harness connector for short circuits to one another.

3. If CMP sensor harness connector circuits are okay and 4.5 volts minimum is present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace CMP sensor. If CMP sensor harness connector circuits are okay, but no voltage is present between terminals No. 1 and 3 of CMP sensor 3-pin harness connector, replace ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4.

NOTE: If DTC P0321/16705 and/or DTC P0322/16706 (Engine Speed (RPM) sensor codes) are also present, see DTC P0321/16705 & DTC P0322/16706 .

For DTC P1340/17748 if CMP sensor is okay check camshaft timing. See TIMING BELT in appropriate ENGINES article.

DTC P1355/17763, DTC P1356/17764, DTC P1357/17765, DTC P1358/17766, DTC P1359/17767 & DTC P1360/17768

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1355/17763: Ignition Activation Cylinder 1 - Open Circuit
- DTC P1356/17764: Ignition Activation Cylinder 1 - Short To B+
- DTC P1357/17765: Ignition Activation Cylinder 1 - Short To Ground
- DTC P1358/17766: Ignition Activation Cylinder 2 - Open Circuit
- DTC P1359/17767: Ignition Activation Cylinder 2 - Short To B+
- DTC P1360/17768: Ignition Activation Cylinder 2 - Short To Ground

Test Requirements

NOTE: Ignition activation pertains to terminals No. 2 and 3 of ignition coil/output stage harness connectors and are cover starting at step 3 in TEST PROCEDURE .

Ensure Camshaft Position sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748** . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705 & DTC P0322/16706** . Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Using DVOM, check voltage supply to ignition coil of cylinder indicated by DTC, (e.g. DTC P1355/17763, check voltage supply to ignition coil/output stage at cylinder No. 1). Disconnect ignition coil harness connector. Turn ignition on, engine off. Check voltage between harness connector terminals No.1 and 2. See **Fig. 41** . Check voltage between harness connector terminals No. 1 and 4, each voltage reading should be a minimum of 11.5 volts. Turn ignition off. If no voltage is present, go to next step. If voltage readings are okay, go to step 6 .
2. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 1 and power supply relay using wiring diagram. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 41** . Resistance reading should be a maximum of 1.5 ohms. If resistance reading is okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 2 and ground, and harness connector terminal No. 4 ground. See **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Cylinder	Ignition Coil Harness Connector Terminal	VAG Test Box Socket
1	3	102
2	3	95
3	3	103
4	3	94

5. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6.

WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.

NOTE: **Removing fuse No. 32 disables fuel injectors. Ignition coils and final output stages are one component and cannot be replaced individually.**

Remove fuse No. 32. Disconnect ignition coil harness connector. Connect LED equipped test light to ignition coil harness connector terminals No. 2 and 3 of cylinder(s) indicated to be misfiring. See **Fig. 41** . Turn ignition on, engine off. Using ignition switch, operate starter, LED must illuminate. If test light does not illuminate, go to step 4 . If test light illuminates, replace faulty ignition coil(s)/output stage(s). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1361/17769, DTC P1362/17770, DTC P1363/17771, DTC P1364/17772, DTC P1365/17773 & DTC P1366/17774

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P1361/17769: Ignition Activation Cylinder 3 - Open Circuit
- DTC P1362/17770: Ignition Activation Cylinder 3 - Short To B+
- DTC P1363/17771: Ignition Activation Cylinder 3 - Short To Ground
- DTC P1364/17772: Ignition Activation Cylinder 4 - Open Circuit
- DTC P1365/17773: Ignition Activation Cylinder 4 - Short To B+
- DTC P1366/17774: Ignition Activation Cylinder 4 - Short To Ground

Test Requirements

NOTE: **Ignition activation pertains to terminals No. 2 and 3 of ignition coil/output stage harness connectors and are covered starting at step 3 in TEST PROCEDURE .**

Ensure Camshaft Position sensor (G163) is okay. See **DTC P1337/17745, DTC P1338/17746 & DTC P1340/17748** . Ensure Engine Speed (RPM) sensor (G28) is okay. See **DTC P0321/16705 & DTC P0322/16706** . Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Using DVOM, check voltage supply to ignition coil of cylinder indicated by DTC, (e.g. DTC P1365/17773, check voltage supply to ignition coil/output stage at cylinder No. 4). Disconnect ignition coil harness connector. Turn ignition on, engine off. Check voltage between harness connector terminals No.1 and 2. See **Fig. 41** . Check voltage between harness connector terminals No. 1 and 4, each voltage reading should be a minimum of 11.5 volts. Turn ignition off. If no voltage is present, go to next step. If

voltage readings are okay, go to step 6 .

2. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 1 and power supply relay using wiring diagram. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 41** . Resistance reading should be a maximum of 1.5 ohms. If resistance reading is okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using DVOM, check wiring for open circuits between ignition coil harness connector terminal No. 2 and ground, and harness connector terminal No. 4 ground. See **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following ignition coil/output stage harness connectors and VAG test box sockets. See **IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION** table and **Fig. 41** . Resistance should be a maximum of 1.5 ohms for each reading. If resistance readings are okay, go to next step. If resistance reading is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

IGNITION COIL HARNESS CONNECTOR/TEST BOX SOCKET IDENTIFICATION

Cylinder	Ignition Coil Harness Connector Terminal	VAG Test Box Socket
1	3	102
2	3	95
3	3	103
4	3	94

5. Check wiring in ignition coil harness connector for short circuits to one another and for short circuits to ground and B+. If resistance measurements are okay and no short circuits exist. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6.

WARNING: During following test do not touch ignition coils, ignition coil harness connectors or test cables.

NOTE: Removing fuse No. 32 disables fuel injectors. Ignition coils and final output stages are one component and cannot be replaced individually.

Remove fuse No. 32. Disconnect ignition coil harness connector. Connect LED equipped test light to ignition coil harness connector terminals No. 2 and 3 of cylinder(s) indicated to be misfiring. See **Fig. 41** . Turn ignition on, engine off. Using ignition switch, operate starter, LED must illuminate. If test light does not illuminate, go to step 4 . If test light illuminates, replace faulty ignition coil(s)/output stage(s).

After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1386/17794, DTC P1387/17795 & DTC P1388/17796

Code Definition

- DTC P1386/17794: ECM (J220) - Malfunction
- DTC P1387/17795: ECM (J220) - Malfunction
- DTC P1388/17796: ECM (J220) - Malfunction

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below:

    - **Beetle**
      Turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **GTI & Jetta**
      Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **Passat**
      Turn ignition off. ECM is located at left rear of engine compartment. Remove ECM protective cover and retaining bracket. See **Fig. 7** . Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.
4. After installing ECM perform following procedures:
    - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC**

TROUBLE CODES .

- Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
- On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
- On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
- On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
- On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
- Perform idle check. See **IDLE CHECK** .
- Generate ECM readiness code. See **READINESS CODE** .

DTC P1409/17819 & DTC P1410/17818

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1409/17819: EVAP Canister Purge Valve (N80) - Circuit Malfunction
- DTC P1410/17818: EVAP Canister Purge Valve (N80) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Canister Purge Valve (N80) should audibly click. EVAP Canister Purge Valve (N80) for Passat is located by bottom of air cleaner. EVAP Canister Purge Valve (N80) for Beetle, GTI and Jetta are located

in engine compartment, center of right side fender. See **Fig. 56** and **Fig. 57** . If EVAP Canister Purge Valve (N80) clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If EVAP Canister Purge Valve (N80) does not click or DTC P0440/16824 or P0441/16825 resets, go to next step.

2. Turn ignition off. Disconnect harness connector from EVAP Canister Purge Valve (N80). Connect LED test light to EVAP canister purge valve harness connector. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash. If test light does not flash, go to next step. If test light flashes, replace faulty EVAP Canister Purge Valve (N80). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Using DVOM check resistance of EVAP Canister Purge Valve (N80) harness connector wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in harness connector for short circuits to one another and to ground and B+. If resistance is okay and no shot circuits are present, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1420/17828, DTC P1421/17829 & DTC P1422/17830

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1420/17828: Secondary Air Injection Valve (N112) - Electrical Circuit Malfunction
- DTC P1421/17829: Secondary Air Injection Valve (N112) - Short To Ground
- DTC P1422/17830: Secondary Air Injection Valve (N112) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Ensure engine is mechanically sound.

Test Procedure

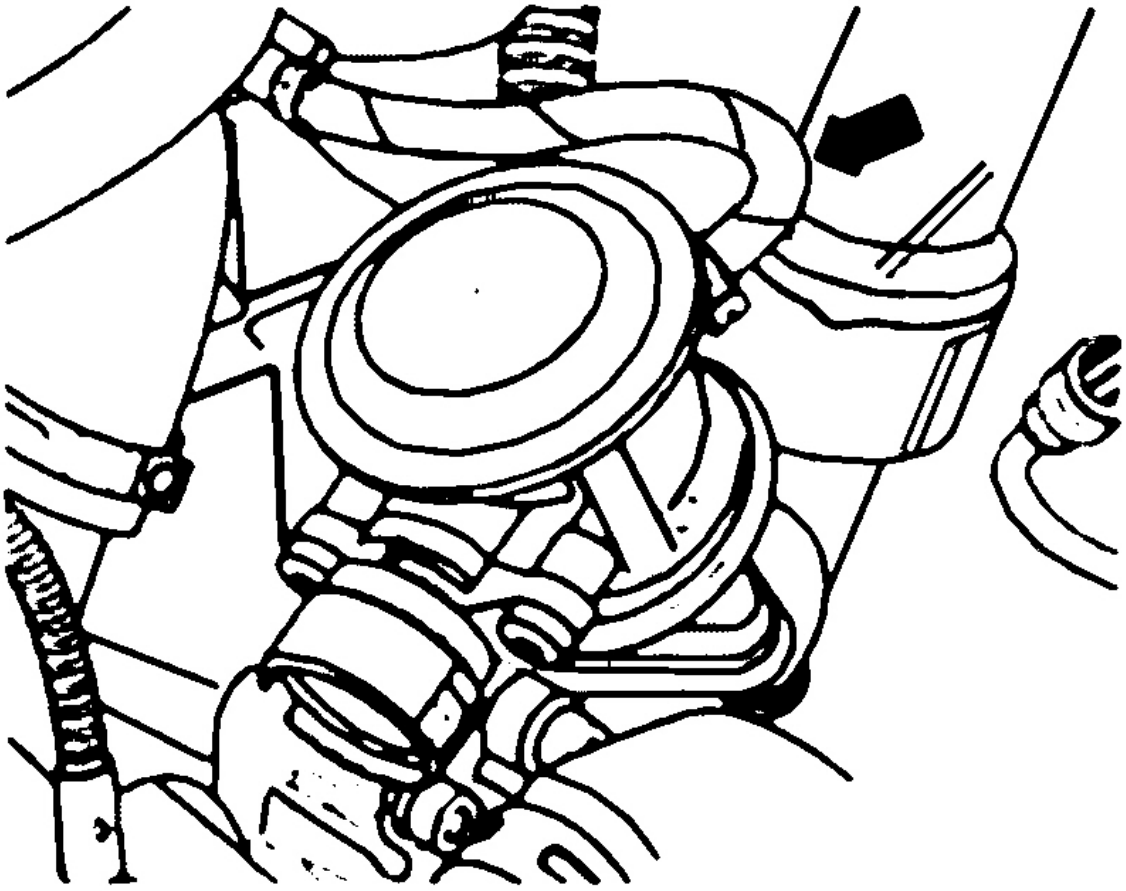
NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1.

NOTE: Secondary air system is activated by ECM and blows air into exhaust pipe upstream of catalytic converter for 100 seconds during a cold start, 41-91° F (5-33°C). Engine must be cold to perform following test procedure.

Check vacuum hoses for Secondary Air Injection System, repair as necessary. Go to next step.

2. Using scan tool, check Secondary Air Injection Valve (N112). See **OUTPUT DIAGNOSTIC TEST MODE** . Secondary Air Injection Valve should audibly click. If Secondary Air Injection Valve clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If Secondary Air Injection Pump Relay does not click, go to step, 4 . If DTC(s) resets, go to next step.
3. Disconnect vacuum hose from combi-valve. See **Fig. 68** . Start engine and idle, vacuum should be present when Secondary Air Pump Motor (V101) is running. If no vacuum is present, go to next step. If vacuum is present, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Disconnect harness connector from Secondary Air Injection Valve (N112). Connect LED test light to secondary air injection valve harness connector, start engine, LED test light should illuminate. If test light does not illuminate, go to next step. If test light illuminates, replace faulty Secondary Air Injection Valve (N112). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Using DVOM check resistance of Secondary Air Injection Valve (N112) wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring for short circuit to one another in Secondary Air Injection Valve (N112) harness connector. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083398

Fig. 68: Locating Secondary Air Injection Valve/Combi-Valve Vacuum Hose (GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1424/17832: SECONDARY AIR SYSTEM - LEAK DETECTED

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Ensure engine is mechanically sound.

Test Procedure

NOTE: Secondary air system is activated by ECM and blows air into exhaust pipe upstream of catalytic converter for 100 seconds during a cold start, 41-91°F (5-33°C).

Check hoses and components of Secondary Air Injection System, for damage, loose fit and improper installation, check vacuum hoses for Secondary Air Injection System, repair as necessary, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1425/17833 & DTC P1426/17834

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1425/17833: EVAP Canister Purge Valve (N80) - Short To Ground
- DTC P1426/17834: EVAP Canister Purge Valve (N80) - Open Circuit

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Canister Purge Valve (N80) should audibly click. EVAP Canister Purge Valve (N80) for Beetle, GTI and Jetta are located in engine compartment, center of right side fender On Passat, EVAP Canister Purge Valve (N80) is located by bottom of air cleaner. See **Fig. 56** and **Fig. 57** .If EVAP Canister Purge Valve (N80) clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If EVAP Canister Purge Valve (N80) does not click or DTC P0440/16824 or P0441/16825 resets, go to next step.
2. Turn ignition off. Disconnect harness connector from EVAP Canister Purge Valve (N80). Connect LED test light to EVAP canister purge valve harness connector. Turn ignition on. Using scan tool, check EVAP Canister Purge Valve (N80). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light should flash. If test light does not flash, go to next step. If test light flashes, replace faulty EVAP Canister Purge Valve (N80). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Using DVOM check resistance of EVAP Canister Purge Valve (N80) harness connector wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in harness connector for short circuits to one another and to ground and B+. If resistance is okay and no shot circuits are present, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn

procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1427/17835, DTC P1428/17836, DTC P1429/17837, DTC P1430/17838 & DTC P1431/17839 (PASSAT)

Code Definition

- DTC P1427/17835: Brake Vacuum Pump (V192) Activation - Short To B+
- DTC P1428/17836: Brake Vacuum Pump (V192) Activation - Short To Ground
- DTC P1429/17837: Brake Vacuum Pump (V192) Activation - Open Circuit
- DTC P1430/17838: Brake Vacuum Pump (V192) Activation - Open/Short To B+
- DTC P1431/17839: Brake Vacuum Pump (V192) Activation - Open/Short To Ground

Test Requirements

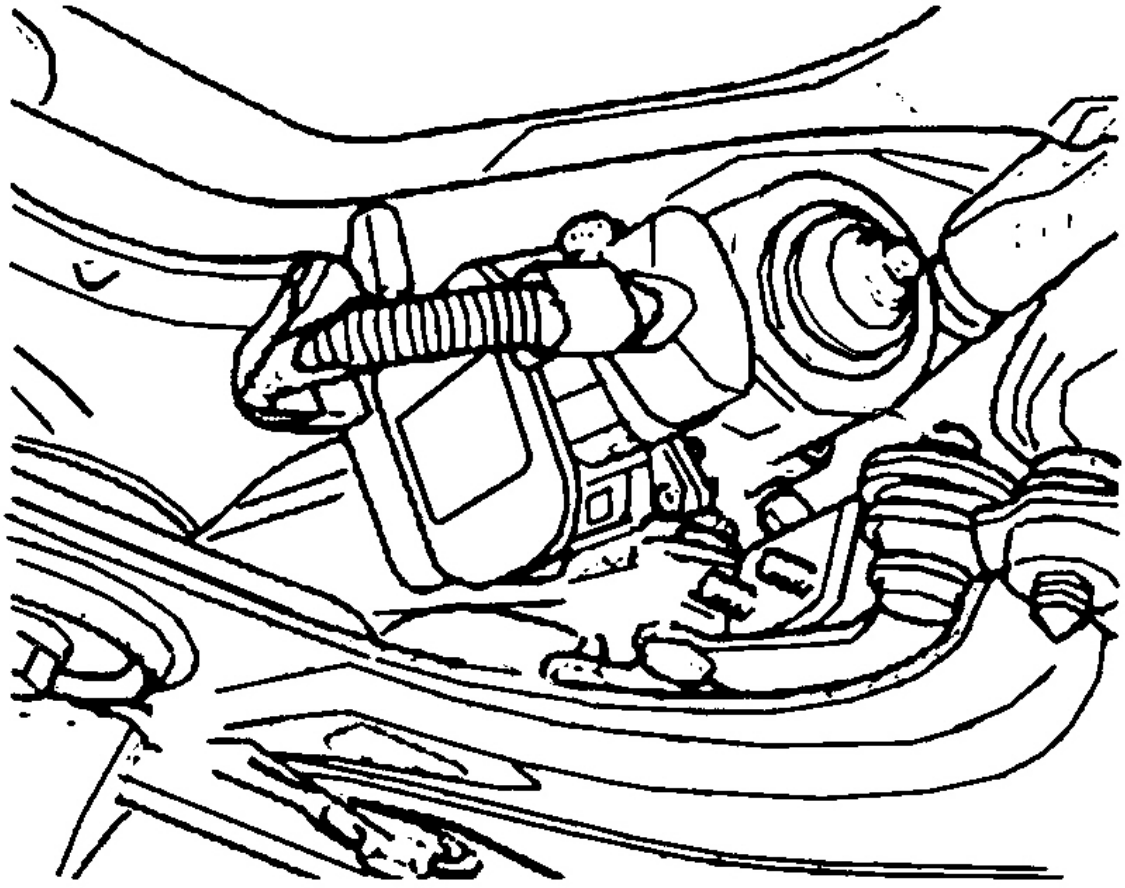
Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: When stating engine, Brake Vacuum Pump (V192) must run briefly. Brake Vacuum Pump (V192) is used on models with A/T only.

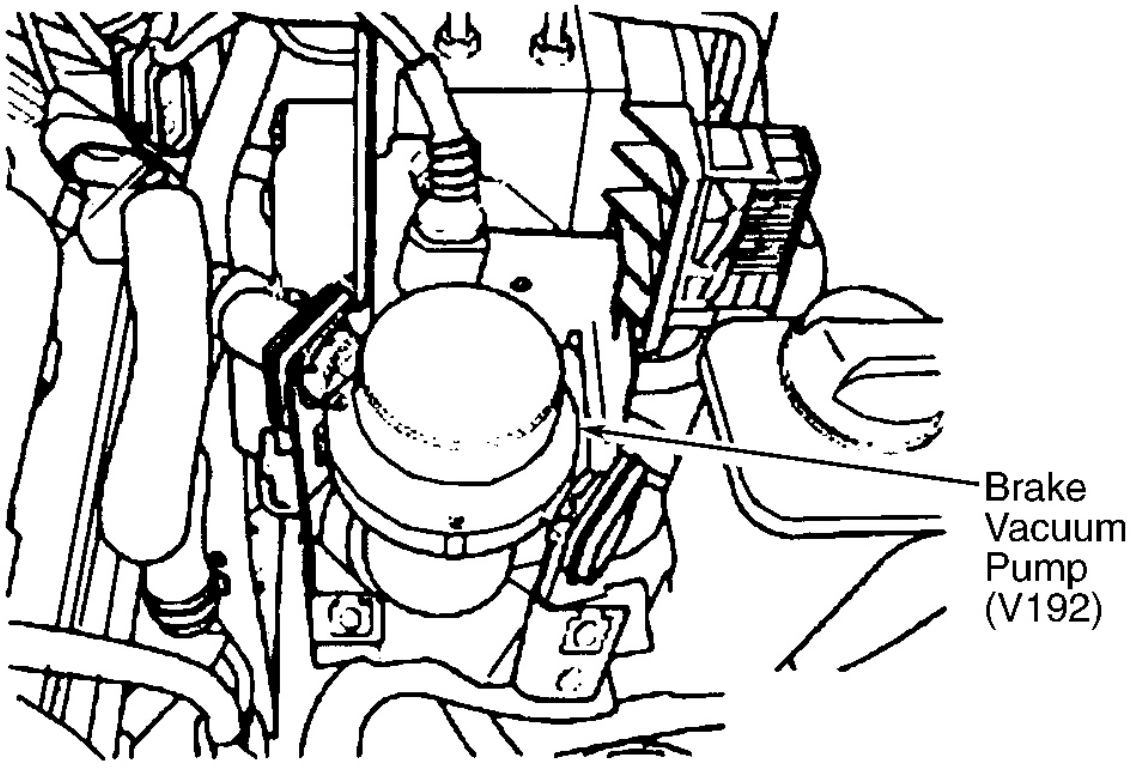
1. **WARNING: Always use jack stands or hoist safeties when working on a raised vehicle.**

   Turn engine off. Lift vehicle, with help from a second person, check Brake Vacuum Pump (V192) operation by touch. On all models except Passat, Brake Vacuum Pump (V192) is located at front lower left subframe. See **Fig. 69** . For Passat see, **Fig. 70** . Start engine. Brake Vacuum Pump (V192) must run briefly. If brake vacuum pump does not run, go to next step. If brake vacuum pump runs briefly, brake vacuum pump is okay. Visually check brake vacuum pump harness connector and wiring for damage (possibly intermittent), erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC for Brake Vacuum Pump (V192) does not reset, test is complete.
2. Check Brake Vacuum Pump (V192) wiring for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083394

Fig. 69: Locating Brake Vacuum Pump (V192) - Beetle, GTI & Jetta
Courtesy of VOLKSWAGEN UNITED STATES, INC.



G00083395

Fig. 70: Locating Brake Vacuum Pump (V192) - Passat
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1432/17840: SECONDARY AIR INJECTION VALVE (N112) - OPEN CIRCUIT

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Ensure engine is mechanically sound.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1.

NOTE: Secondary air system is activated by ECM and blows air into exhaust pipe upstream of catalytic converter for 100 seconds during a cold start, 41-91° F (5-33°C). Engine must be cold to perform following test procedure.

Check vacuum hoses for Secondary Air Injection System, repair as necessary. Go to next step.

2. Using scan tool, check Secondary Air Injection Valve (N112). See **OUTPUT DIAGNOSTIC TEST MODE** . Secondary Air Injection Valve should audibly click. If Secondary Air Injection Valve clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If Secondary Air Injection Pump Relay does not click, go to step, 4 . If DTC(s) resets, go to next step.
3. Disconnect vacuum hose from combi-valve. See **Fig. 68** . Start engine and idle, vacuum should be present when Secondary Air Pump Motor (V101) is running. If no vacuum is present, go to next step. If vacuum is present, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Disconnect harness connector from Secondary Air Injection Valve (N112). Connect LED test light to secondary air injection valve harness connector, start engine, LED test light should illuminate. If test light does not illuminate, go to next step. If test light illuminates, replace faulty Secondary Air Injection Valve (N112). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Using DVOM check resistance of Secondary Air Injection Valve (N112) wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring for short circuit to one another in Secondary Air Injection Valve (N112) harness connector. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1433/17841, DTC P1434/17842, DTC P1435/17843 & DTC P1436/17844

Code Definition

- DTC P1433/17841: Secondary Air Injection Pump Relay (J299) - Open Circuit
- DTC P1434/17842: Secondary Air Injection Pump Relay (J299) - Short To B+
- DTC P1435/17843: Secondary Air Injection Pump Relay (J299) - Short To Ground
- DTC P1436/17844: Secondary Air Injection Pump Relay (J299) - Electrical Circuit Malfunction

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Ensure engine is mechanically sound.

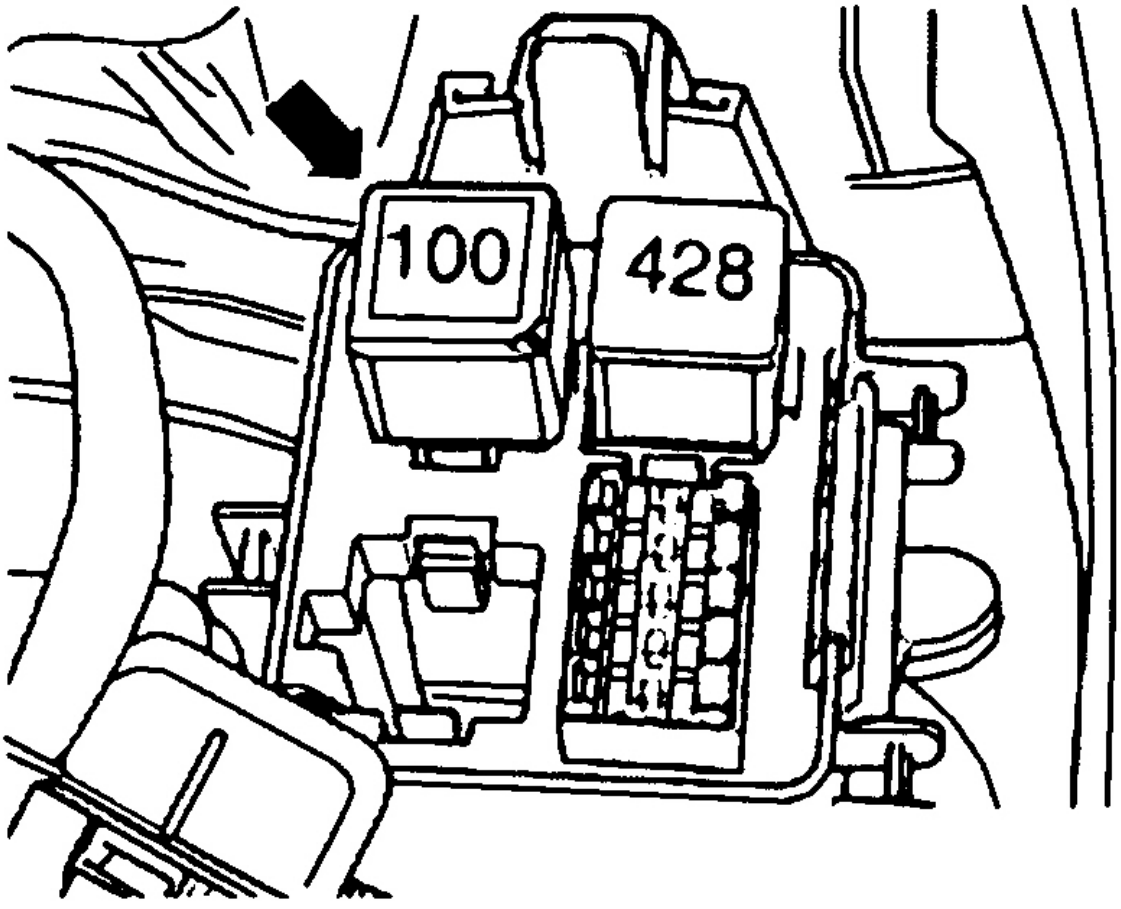
Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Using scan tool, check Secondary Air Injection Pump Relay (J299). See **OUTPUT DIAGNOSTIC**

TEST MODE . Secondary Air Injection Pump Relay should audibly click. Secondary Air Injection Pump Relay (J299) for Beetle is located in relay/fuse box next to master cylinder, for GTI, Jetta and Passat. See **Fig. 71** and **Fig. 55** . If Secondary Air Injection Pump Relay clicks, erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If Secondary Air Injection Pump Relay does not click or DTC P0418/16802 resets, go to next step.

2. Using DVOM check resistance of Secondary Air Injection Pump Relay wiring. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. If resistance is okay, replace faulty Secondary Air Injection Pump Relay (J299). Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is not okay, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .



G00083400

Fig. 71: Locating Secondary Air Injection Pump Relay (J299 - GTI & Jetta)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1470/17878, DTC P1471/17879, DTC P1472/17880 & DTC P1473/17881

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all

wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1470/17878: EVAP Leak Detection Pump (V144) - Electrical Circuit Malfunction
- DTC P1471/17879: EVAP Leak Detection Pump (V144) - Short To B+
- DTC P1472/17880: EVAP Leak Detection Pump (V144) - Short To Ground
- DTC P1473/17881: EVAP Leak Detection Pump (V144) - Open Circuit

Test Requirements

Ensure intake air is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C). Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Using scan tool, check EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals. If EVAP Leak Detection Pump (V144) does not run, go to next step.
2. Disconnect EVAP Leak Detection Pump (V144) harness connector, install LED test light at EVAP leak detection pump harness connector terminals No. 2 and 3. See **Fig. 72** . Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light at EVAP Leak Detection Pump (V144) harness connector should flash. If LED test light at EVAP Leak Detection Pump (V144) harness connector does not flash, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 72** .
    - EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
    - EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.

- EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1 and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.

4. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Check EVAP Canister Purge Valve (N80). See **DTC P0440/16824 & DTC P0441/16825** .
6. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.**

   Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions, check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. See EVAP System Overview in appropriate SYSTEM & COMPONENT TESTING. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If DTC returns on test drive, go to next step.

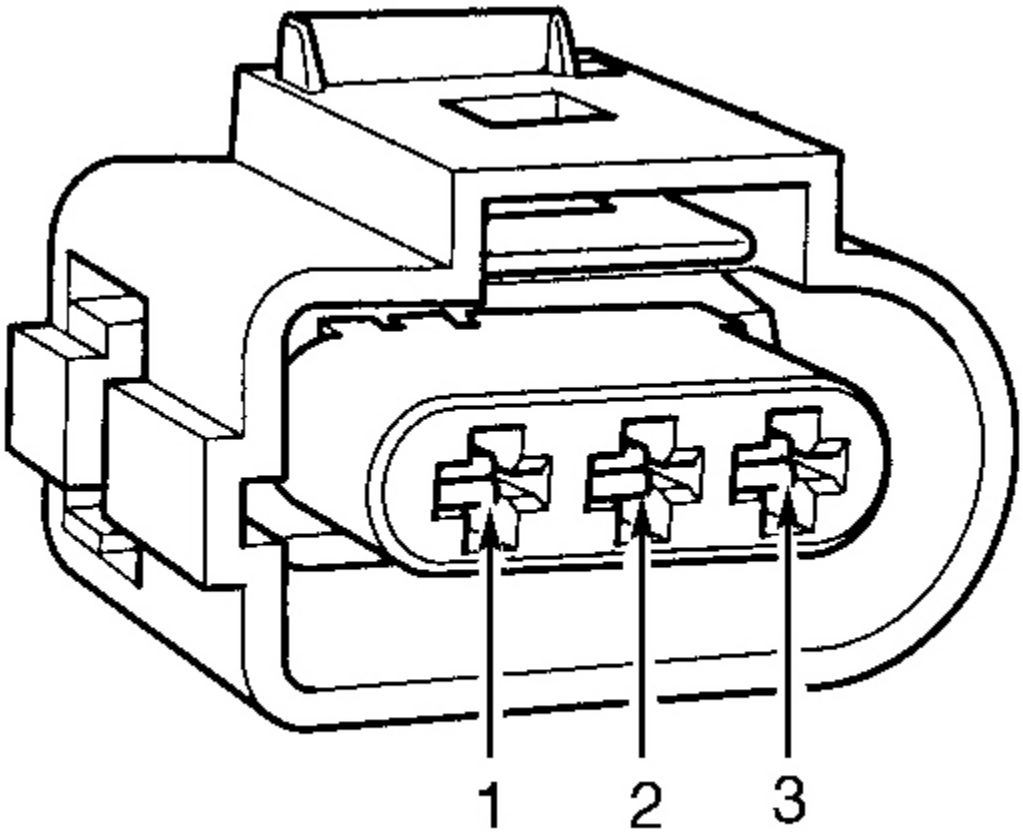


Fig. 72: Identifying EVAP Leak Detection Pump (V144) Harness Connector Terminals
Courtesy of VOLKSWAGEN UNITED STATES, INC.

DTC P1475/17883, DTC P1476/17884 & DTC P1477/17885

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1475/17883: EVAP Leak Detection Pump (V144) - No Signal
- DTC P1476/17884: EVAP Leak Detection Pump (V144) - Insufficient Vacuum
- DTC P1477/17885: EVAP Leak Detection Pump (V144) - Malfunction

Test Requirements

Ensure intake air is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C). Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system

leaks exist.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals. If EVAP Leak Detection Pump (V144) does not run, go to next step.
2. Disconnect EVAP Leak Detection Pump (V144) harness connector, install LED test light at EVAP leak detection pump harness connector terminals No. 2 and 3. See **Fig. 72** . Turn ignition on. Using scan tool, activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light at EVAP Leak Detection Pump (V144) harness connector should flash. If LED test light at EVAP Leak Detection Pump (V144) harness connector does not flash, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 72** .
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

   Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1 and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.
4. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Check EVAP Canister Purge Valve (N80). See **DTC P0440/16824 & DTC P0441/16825** .
6. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7.

NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.

Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions, check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. See EVAP System Overview in appropriate SYSTEM & COMPONENT TESTING. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If DTC returns on test drive, go to next step.

DTC P1478/17886: EVAP LEAK DETECTION PUMP (V144) - BLOCKED TUBE/HOSE

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure intake air is less than 140°F (60°C). Ensure engine coolant temperature is less than 176°F (80°C). Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist.

Test Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

1. Check tubing and hoses from fuel tank to throttle body. If tubing and hoses are okay, go to next step. If tubing and/or hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check EVAP Canister Purge Valve (N80). See **DTC P0440/16824 & DTC P0441/16825** .
3. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . EVAP Leak Detection Pump (V144) should run in intervals. If EVAP Leak Detection Pump (V144) does not run, go to next step.
4. Disconnect EVAP Leak Detection Pump (V144) harness connector, install LED test light at EVAP leak detection pump harness connector terminals No. 2 and 3. See **Fig. 72** . Turn ignition on. Using scan tool,

activate EVAP Leak Detection Pump (V144). See **OUTPUT DIAGNOSTIC TEST MODE** . LED test light at EVAP Leak Detection Pump (V144) harness connector should flash. If LED test light at EVAP Leak Detection Pump (V144) harness connector does not flash, go to next step. If LED test light at EVAP Leak Detection Pump (V144) harness connector flashes, replace faulty EVAP Leak Detection Pump (V144). Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between the following EVAP Leak Detection Pump (V144) harness connector terminals and test box sockets. See **Fig. 72** .
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 1 and test box socket No. 80.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 2 and test box socket No. 25.
   - EVAP Leak Detection Pump (V144) harness connector terminal No. 3 and Fuel Pump Relay (J17). See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

   Resistance should be a maximum of 1.5 ohms for each reading. Check harness connector wiring No. 1 and 2 for short circuit to one another and all harness connector wiring for short circuit to ground and B+. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If EVAP Leak Detection Pump (V144) wiring is okay, go to next step.
6. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. **NOTE: When checking for leaks in EVAP system, pay particular attention to fuel tank filler cap, EVAP Canister Purge Valve (N80), EVAP Canister and EVAP canister hose connections.**

   Turn ignition on. Using scan tool, follow scan tool manufacturer's instructions, check EVAP system for leaks. If leak(s) are detected, check fuel tank filler cap using a fuel tank filler cap tester, check fuel pump housing, EVAP canister, EVAP components, hoses and tubes for leaks. See EVAP System Overview in appropriate SYSTEM & COMPONENT TESTING. Repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If no leaks are detected. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC does not reset on test drive. Test is complete. If DTC returns on test drive, go to next step.

DTC P1479/17887: BRAKE VACUUM SYSTEM - MECHANICAL MALFUNCTION

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: When stating engine, Brake Vacuum Pump (V192) must run briefly. Brake Vacuum Pump (V192) is used on models with A/T only.

1. **WARNING: Always use jack stands or hoist safeties when working on a raised vehicle.**

   Turn engine off. Lift vehicle, with help from a second person, check Brake Vacuum Pump (V192) operation by touch. On all models except Passat, Brake Vacuum Pump (V192) is located at front lower left subframe. See **Fig. 69** . For Passat see, **Fig. 70** . Start engine. Brake Vacuum Pump (V192) must run briefly. If brake vacuum pump does not run, go to next step. If brake vacuum pump runs briefly, brake vacuum pump is okay. Visually check brake vacuum pump harness connector and wiring for damage (possibly intermittent), erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC for Brake Vacuum Pump (V192) does not reset, test is complete.
2. Check Brake Vacuum Pump (V192) wiring for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1500/17908, DTC P1501/17909 & DTC P1502/17910

Code Definition

- DTC P1500/17908: Fuel Pump Relay (J17) - Circuit Malfunction
- DTC P1501/17909: Fuel Pump Relay (J17) - Short To Ground
- DTC P1502/17910: Fuel Pump Relay (J17) - Short To B+

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Using DVOM, check power supply and ground to Fuel Pump Relay. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Check resistance of Fuel Pump Relay wiring. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check Fuel Pump Relay wiring for short circuits to one another, and for short circuits to B+ and ground. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If resistance, voltage and ground supply are okay and no short circuits are present, replace faulty Fuel Pump Relay (J17). If resistance and/or voltage or ground supply are not okay or a short circuit is present, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1517/17925: POWER SUPPLY RELAY (J271) - ELECTRICAL CIRCUIT MALFUNCTION

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Using DVOM, check resistance of Power Supply Relay wiring. Power Supply Relay is located at left rear of engine compartment. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. If resistance is okay, replace faulty Power Supply Relay (J271). If resistance is not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1519/17927, DTC P1529/17937, DTC P1530/17938 & DTC P1531/17939

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P1519/17927: Camshaft Position Adjustment - Malfunction
- DTC P1529/17937: Camshaft Adjustment Valve (N205) - Short To B+
- DTC P1530/17938: Camshaft Adjustment Valve (N205) - Short To Ground
- DTC P1531/17939: Camshaft Adjustment Valve (N205) - Open Circuit

NOTE: **Camshaft adjustment occurs depending on engine load and RPM. Camshaft adjustment valve is opened by ECM, directing oil pressure to camshaft adjuster, which moves camshaft. Camshaft adjuster may fail either electrically or mechanically. After verifying or repairing electrical portion of system, camshaft adjuster may still be faulty. Repair camshaft adjuster mechanical failure as necessary. See step 6 .**

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Testing Procedure

NOTE: Output Diagnostic Test Mode is used when using Scan Tools VAG 1551/1552 or VAS 5051/5052, always continue with output diagnostic test mode until last component in output diagnostic test mode test sequence has been checked. If you are not using Scan Tools VAG 1551/1552 or VAS 5051/5052 follow scan tool manufacturer's instructions.

NOTE: When using scan tool to activate camshaft adjustment valve, it is barely audible. Use mechanics stethoscope if necessary.

1. **Electrical Circuit Test -** Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Using scan tool, activate camshaft adjustment valve. See **OUTPUT DIAGNOSTIC TEST MODE** . Camshaft adjustment valve should audibly click. If valve clicks, go to step 6 . If valve does not click, go to next step.
2. Using DVOM, check resistance of camshaft adjustment valve. See **Fig. 16** . Resistance should be 10-18 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty camshaft adjustment valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Disconnect camshaft adjustment valve harness connector. See **Fig. 15** . Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to camshaft adjustment valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of camshaft adjustment valve. Turn ignition off. Replace faulty camshaft adjustment valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, measure resistance between camshaft adjustment valve connector terminal No. 2 and test box socket No. 115. See **Fig. 17** . Record resistance reading. Resistance should be a maximum of 1.5 ohms. Check camshaft adjustment valve harness connector terminal No. 2 for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Using DVOM, check resistance between camshaft adjustment valve connector terminal No. 1 and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. **Mechanical Test -** Connect Scan Tool. See **CONNECTING VAG TEST BOX** . Start engine and bring to operating temperature. On Beetle, GTI and Jetta with engine code (AWP), go to next step. On Beetle, GTI and Jetta with engine code (AWV & AWW), go to step 8 . Passat, go to step 9 .
7. Place transmission in neutral (M/T) or Park (A/T). Set parking brake. Depress and hold brake pedal. Accelerate to Wide Open Throttle (WOT). Engine speed will increase (by ECM) to approximately 2300 RPM. Continue to hold brake pedal and maintain engine speed. Observe camshaft adjuster on scan tool.

Scan tool will operate camshaft adjuster from off to on. Continue to hold brake pedal and maintain engine speed until scan tool indicates system is okay. If scan tool indicates system is okay, mechanical test is okay. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If scan tool does not indicate system is okay, read DTC memory. If DTC P1519/17927 appears, it may be because camshaft adjustment valve correctly switches oil pressure to mechanical camshaft adjuster, but camshaft adjuster cannot reach its end position, (e.g. tight/partially seized). Repair or replace faulty camshaft adjuster as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

8. **NOTE: An aftermarket scan tool may not be able to perform mechanical test procedure properly. Manufacturer recommends using VAG 1551/1552.**

   Place transmission in neutral (M/T) or Park (A/T). Set parking brake. Using accelerator pedal prop, manually set engine speed to 1800-2200 RPM. Observe camshaft adjuster on scan tool. Scan tool will operate camshaft adjuster from off to on. Continue to maintain engine speed until scan tool indicates system is okay. If scan tool indicates system is okay, mechanical test is okay. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If scan tool does not indicate system is okay, read DTC memory. If DTC P1519 (VAG will display DTC 17927) appears, it may be because camshaft adjustment valve correctly switches oil pressure to mechanical camshaft adjuster, but camshaft adjuster cannot reach its end position, (e.g. tight/partially seized). Repair or replace faulty camshaft adjuster as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and bring to operating temperature. Using scan tool. Check camshaft adjustment at idle. Specification with engine code (AWM) is CAM-ADJ.ON. Check camshaft adjustment under load. With a helper to operate tester from rear seat. Observe scan tool readings. From a stop, accelerate to Wide Open Throttle (WOT) in 1st gear (M/T), 2nd (A/T) to over 3200 RPM. If scan tool indicates system is okay, mechanical test is okay. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If scan tool does not indicate system is okay. It may be because camshaft adjustment valve correctly switches oil pressure to mechanical camshaft adjuster, but camshaft adjuster cannot reach its end position, (e.g. tight/partially seized). Repair or replace faulty camshaft adjuster as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1523/17931: CRASH SIGNAL FROM AIRBAG CONTROL MODULE (J234) - IMPLAUSIBLE SIGNAL

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Check Air Bag Control Module (J234) for DTC(s). See DIAGNOSTICS in appropriate AIR BAG RESTRAINT SYSTEMS article, under RESTRAINTS. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN**

PROCEDURE .

DTC P1539/17947: CLUTCH VACUUM VENT SWITCH (F36) - IMPLAUSIBLE SIGNAL

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Clutch Vacuum Vent Switch (F36) for DTCs, this is done in display group 66 when using Scan Tool VAG 1551/1552 or VAS 5051/5052. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check Clutch Vacuum Vent Switch (F36). Remove trim at clutch pedal to access clutch vacuum vent switch and disconnect clutch vacuum vent switch harness connector. Using DVOM check resistance at clutch vacuum vent switch, resistance should be 0 ohms (closed circuit), depress clutch pedal, resistance should be infinite (open circuit). If Clutch Vacuum Vent Switch (F36) is okay , go to next step. If Clutch Vacuum Vent Switch (F36) is not okay, replace faulty Clutch Vacuum Vent Switch (F36). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Using DVOM check Clutch Vacuum Vent Switch (F36) harness connector wiring resistance. Resistance should be a maximum of 1.5 ohms for each reading. Check Clutch Vacuum Vent Switch (F36) harness connector wiring for short circuit to one another, short circuit to ground, and short circuit to B+. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If Clutch Vacuum Vent Switch (F36) is okay and wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1541/17949: FUEL PUMP RELAY (J17) - OPEN CIRCUIT

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts. Ensure all electrical accessories are off and A/C

is off.

Test Procedure

Using DVOM, check power supply and ground to Fuel Pump Relay. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Check resistance of Fuel Pump Relay wiring. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms for each reading. Check Fuel Pump Relay wiring for short circuits to one another, and for short circuits to B+ and ground. See **Fig. 38** . See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If resistance, voltage and ground supply are okay and no short circuits are present, replace faulty Fuel Pump Relay (J17). If resistance and/or voltage or ground supply are not okay or a short circuit is present, repair as necessary. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1542/17950, DTC P1543/17951, DTC P1544/17952 & DTC P1545/17953

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1542/17950: Angle Sensor 1 (G187) For Throttle Valve Drive - Implausible Signal
- DTC P1543/17951: Angle Sensor 1 (G187) For Throttle Valve Drive - Signal Too Low
- DTC P1544/17952: Angle Sensor 1 (G187) For Throttle Valve Drive - Signal Too High
- DTC P1545/17953: Throttle Valve Control Malfunction

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically

sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
5. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs,

erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118
6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1546/17954, DTC P1547/17955 & DTC P1548/17956

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1546/17954: Wastegate By-Pass Regulator Valve (N75) - Short To B+
- DTC P1547/17955: Wastegate By-Pass Regulator Valve (N75) - Short To Ground
- DTC P1548/17956: Wastegate By-Pass Regulator Valve (N75) - Open Circuit

Test Requirements

NOTE: When diagnosing DTCs P1546/17954-1557/17965 first check turbocharger charge pressure. See TEST PROCEDURE - WASTEGATE BY-PASS REGULATOR VALVE , then check TEST PROCEDURE - TURBOCHARGER, CHARGE PRESSURE (BEETLE - ENGINE CODE AWV) or TEST PROCEDURE - TURBOCHARGER, CHARGE PRESSURE (BEETLE - ENGINE CODE AWP, GTI, JETTA & PASSAT) .

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure - Wastegate By-Pass Regulator Valve

NOTE: When using scan tool to activate wastegate by-pass regulator valve, it is barely audible, check by touch or use mechanics stethoscope if necessary.

1. Turn ignition off. Locate wastegate by-pass regulator valve. See **COMPONENT LOCATIONS** . Check hoses to wastegate by-pass regulator valve (N75). If hoses are okay, go to next step. If hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Disconnect wastegate by-pass regulator valve harness connector. Measure resistance between valve terminals. See **Fig. 39** or **Fig. 40** . If resistance is between 25-35 ohms, go to next step. If resistance is not 25-35 ohms, replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Using scan tool, activate wastegate by-pass regulator valve. See **OUTPUT DIAGNOSTIC TEST MODE** . Wastegate by-pass regulator valve should audibly click. If wastegate by-pass regulator valve clicks. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wastegate by-pass regulator valve does not click, go to next step.
4. Disconnect wastegate by-pass regulator valve harness connector. See **COMPONENT LOCATIONS** . Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to wastegate by-pass regulator valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of wastegate by-pass regulator valve. Turn ignition off. Replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, measure resistance between wastegate by-pass regulator valve harness connector terminal No. 2

and test box socket No. 104. See **Fig. 17** . Record resistance reading. Resistance should be a maximum of 1.5 ohms. Check terminal No. 2 of wastegate by-pass regulator valve harness connector for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

6. Using DVOM, check resistance between wastegate by-pass regulator valve harness connector terminal No. 1 and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Turbocharger, Charge Pressure (Beetle - Engine Code AWV)

1. Using a "T" fitting, install Turbocharger Tester (VAG 1397A) in intake manifold to charge pressure by-pass valve hose. Select measuring range I on turbocharger tester.

CAUTION: Test duration during measurement should be limited to a maximum of 10 seconds.

2. With a helper to operate tester from rear seat. Accelerate to wide open throttle from 2000 RPM in 3rd gear (M/T) or position "2" (A/T). Press "M" button on turbocharger tester when engine speed is at 3000 RPM. Boost pressure should be 18.5-20.5 psi (1.3-1.4 bar).
3. If specified boost pressure is exceeded, go to next step. If specified boost pressure is not as specified, recheck wastegate by-pass regulator. See **TEST PROCEDURE - WASTEGATE BY-PASS REGULATOR VALVE** and replace as necessary. Repeat turbocharger test.
4. Check for blockage between charge air cooler and turbocharger. Check wastegate and operating rod operation. Ensure wastegate by-pass valve is securely mounted to turbocharger. Repair as necessary. Check for stuck wastegate due to corrosion. If valve is stuck, replace turbocharger. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Turbocharger, Charge Pressure (Beetle - Engine Code AWP, GTI, Jetta & Passat)

NOTE: Beetle with engine code (AWP), GTI, Jetta and Passat turbocharger performance may only be checked using a scan tool.

1. Start engine and idle. With a helper to operate tester from rear seat. Using scan tool check duty cycle of wastegate by-pass regulator valve. Accelerate to Wide Open Throttle (WOT). Observe duty cycle percentage in the 1800-2300 RPM range. Record readings. Duty cycle reading should be from 5 to 95 percent. If reading is okay, go to next step. If reading is not okay, see **CHARGE AIR PRESSURE SENSOR** and replace as necessary. Repeat step 1.

CAUTION: Test duration during measurement should be limited to a maximum of 10 seconds.

2. With a helper to operate tester from rear seat. Using scan tool check actual boost pressure at WOT. Accelerate to wide open throttle from low speed in 2nd gear (M/T) or 4th gear with Tiptronic System (A/T). Press VAG 1551 PRINT button when engine speed is between 1800-2300 RPM. Read boost value. Boost value should be 19.6-25.4 psi (1.35-1.75 bar). For engine code AWP boost value should be 24.7-29.0 psi (1.70-2.00 bar). Compare actual boost pressure with specification in display field 3. Maximum difference is 1.5 psi (.1 bar). Repeat measurement if boost pressure was not fully charged or difference between actual and specified values was to large.
3. If boost pressure reading is not okay, see **CHARGE AIR PRESSURE SENSOR** . If boost pressure is still not okay check turbocharger for damage or blockage. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1550/17958, DTC P1555/17963, DTC P1556/17964 & DTC P1557/17965

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1550/17958: Charge Pressure - Control Deviation
- DTC P1555/17963: Maximum Charge Pressure - Exceeded
- DTC P1556/17964: Charge Pressure - Control Limit Not Achieved
- DTC P1557/17965: Charge Pressure - Control Limit Exceeded

Test Requirements

NOTE: When diagnosing DTCs P1546/17954-1557/17965 first check TEST PROCEDURE - WASTEGATE BY-PASS REGULATOR VALVE , than check TEST PROCEDURE - TURBOCHARGER, CHARGE PRESSURE (BEETLE - ENGINE CODE AWV) or TEST PROCEDURE - TURBOCHARGER, CHARGE PRESSURE (BEETLE - ENGINE CODE AWP, GTI, JETTA & PASSAT) turbocharger charge pressure.

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure - Wastegate By-Pass Regulator Valve

NOTE: When using scan tool to activate wastegate by-pass regulator valve, it is barely audible, check by touch or use mechanics stethoscope if necessary.

1. Turn ignition off. Locate wastegate by-pass regulator valve. See **COMPONENT LOCATIONS** . Check hoses to wastegate by-pass regulator valve (N75). If hoses are okay, go to next step. If hoses are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Disconnect wastegate by-pass regulator valve harness connector. Measure resistance between valve terminals. See **Fig. 39** or **Fig. 40** . If resistance is between 25-35 ohms, go to next step. If resistance is not 25-35 ohms, replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Using scan tool, activate wastegate by-pass regulator valve. See **OUTPUT DIAGNOSTIC TEST MODE** . Wastegate by-pass regulator valve should audibly click. If wastegate by-pass regulator valve clicks. Erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wastegate by-pass regulator valve does not click, go to next step.
4. Disconnect wastegate by-pass regulator valve harness connector. See **COMPONENT LOCATIONS** . Using adapter cables from Test Kit (VAG 1594), connect Voltage Tester (VAG 1527) to wastegate by-pass regulator valve harness connector. Observe voltage tester LED. Voltage tester LED should blink (light to dark). If voltage tester LED did not blink, go to next step. If voltage tester LED blinks, using scan tool, stop actuation of wastegate by-pass regulator valve. Turn ignition off. Replace faulty wastegate by-pass regulator valve. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
5. Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, measure resistance between wastegate by-pass regulator valve harness connector terminal No. 2 and test box socket No. 104. See **Fig. 17** . Record resistance reading. Resistance should be a maximum of 1.5 ohms. Check terminal No. 2 of wastegate by-pass regulator valve harness connector for short circuit to battery positive and ground. If readings are okay, go to next step. If readings are not okay, repair as necessary. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Using DVOM, check resistance between wastegate by-pass regulator valve harness connector terminal No. 1 and fuel pump relay. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Resistance should be a maximum of 1.5 ohms. If resistance is not okay, repair as necessary. Verify repair. Test is complete. If resistance is okay and all wiring is okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Turbocharger, Charge Pressure (Beetle - Engine Code AWV)

1. Using a "T" fitting, install Turbocharger Tester (VAG 1397A) in intake manifold to charge pressure by-pass valve hose. Select measuring range I on turbocharger tester.

CAUTION: Test duration during measurement should be limited to a maximum of 10 seconds.

2. With a helper to operate tester from rear seat. Accelerate to wide open throttle from 2000 RPM in 3rd

gear (M/T) or position "2" (A/T). Press "M" button on turbocharger tester when engine speed is at 3000 RPM. Boost pressure should be 18.5-20.5 psi (1.3-1.4 bar).

3. If specified boost pressure is exceeded, go to next step. If specified boost pressure is not as specified, recheck wastegate by-pass regulator. See **TEST PROCEDURE - WASTEGATE BY-PASS REGULATOR VALVE** and replace as necessary. Repeat turbocharger test.
4. Check for blockage between charge air cooler and turbocharger. Check wastegate and operating rod operation. Ensure wastegate by-pass valve is securely mounted to turbocharger. Repair as necessary. Check for stuck wastegate due to corrosion. If valve is stuck, replace turbocharger. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - Turbocharger, Charge Pressure (Beetle - Engine Code AWP, GTI, Jetta & Passat)

1.

NOTE: Beetle with engine code (AWP), GTI, Jetta and Passat turbocharger performance may only be checked using a scan tool.

Start engine and idle. With a helper to operate tester from rear seat. Using scan tool check duty cycle of wastegate by-pass regulator valve. Accelerate to Wide Open Throttle (WOT). Observe duty cycle percentage in the 1800-2300 RPM range. Record readings. Duty cycle reading should be from 5 to 95 percent. If reading is okay, go to next step. If reading is not okay, see **CHARGE AIR PRESSURE SENSOR** and replace as necessary. Repeat step 1 .

CAUTION: Test duration during measurement should be limited to a maximum of 10 seconds.

2. With a helper to operate tester from rear seat. Using scan tool check actual boost pressure at WOT. Accelerate to wide open throttle from low speed in 2nd gear (M/T) or 4th gear with Tiptronic System (A/T). Press VAG 1551 PRINT button when engine speed is between 1800-2300 RPM. Read boost value. Boost value should be 19.6-25.4 psi (1.35-1.75 bar). For engine code AWP boost value should be 24.7-29.0 psi (1.70-2.00 bar). Compare actual boost pressure with specification in display field 3. Maximum difference is 1.5 psi (.1 bar). Repeat measurement if boost pressure was not fully charged or difference between actual and specified values was to large.
3. If boost pressure reading is not okay, see **CHARGE AIR PRESSURE SENSOR** . If boost pressure is still not okay check turbocharger for damage or blockage. Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1558/17966: THROTTLE VALVE DRIVE (186) - CIRCUIT MALFUNCTION

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If

APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.

5. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117
4	84
5	118
6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE**

RELEARN PROCEDURE .

9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1559/17967: THROTTLE VALVE CONTROL MODULE (J338) - MALFUNCTION IN BASIC SETTING

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Throttle Valve Control Module Adaption

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 060, (VAG 1551/1552 or VAS 5051/5052). Follow scan tool manufacturer's instructions.

1. **NOTE: Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 50-194° F (10-90° C). Battery voltage a minimum of 11.5 volts.**

   Connect scan tool to DLC. DLC is located on left side of steering column. Using scan tool check and clear any DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .

2. **NOTE: ECM will abort adaptation if; throttle valve cannot be closed completely (e.g. dirty throttle body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation.**

   Using scan tool, follow scan tool manufacturer's instructions for TVCM (J338) adaptation. If you are using Scan Tool VAG 1551/1552 or VAS 5051/5052, from selection 1 enter diagnostic function 04 - BASIC SETTING. Follow scan tool instructions to enter diagnostic function 04 - BASIC SETTING function. Enter DISPLAY GROUP 060. Follow scan tool instructions for TVCM (J338) adaptation.

DTC P1560/17968: MAXIMUM ENGINE RPM EXCEEDED

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts, all electrical accessories are off, A/C is off. Engine is mechanically sound. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Check and record DTCs. Erase DTCs. Repair mechanical damage.

DTC P1564/17972: THROTTLE VALVE CONTROL MODULE (J338) - VOLTAGE TOO LOW DURING BASIC SETTING

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Throttle Valve Control Module Adaption

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 060, (VAG 1551/1552 or VAS 5051/5052). Follow scan tool manufacturer's instructions.

1. **NOTE: Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 50-194° F (10-90° C). Battery voltage a minimum of 11.5 volts.**

   Check charging system and battery condition. Repair as necessary. Go to next step.
2. Connect scan tool to DLC. DLC is located on left side of steering column. Using scan tool check and clear any DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
3. **NOTE: ECM will abort adaptation if; throttle valve cannot be closed completely (e.g. dirty throttle body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation.**

   Using scan tool, follow scan tool manufacturer's instructions for TVCM (J338) adaptation. If you are

using Scan Tool VAG 1551/1552 or VAS 5051/5052, from selection 1 enter diagnostic function 04 - BASIC SETTING. Follow scan tool instructions to enter diagnostic function 04 - BASIC SETTING function. Enter DISPLAY GROUP 060. Follow scan tool instructions for TVCM (J338) adaptation.

DTC P1565/17973 & DTC P1568/17976

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1565/17973: Throttle Valve Control Module (J338) - Lower Limit Not Reached
- DTC P1568/17976: Throttle Valve Control Module (J338) - Mechanical Malfunction

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. Check throttle body for residue/dirt buildup. Clean throttle body as necessary. Check throttle body for damage. Repair or replace throttle body as necessary. If throttle body was cleaned, repaired or replaced, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If DTC resets on test drive, go to next step.

2. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
4. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 7 . If throttle valve drive angle sensor tests are okay, go to next step.
5. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
6. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92
2	83
3	117

4	84
5	118
6	91

8. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

9. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
10. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1569/17977: CRUISE CONTROL SWITCH (E45) - IMPLAUSIBLE SIGNAL

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check cruise control system for DTCs. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1570/17978: ECM (J220) - BLOCKED

Immobilizer Adaptation To ECM (J220)

NOTE: **For Model Year 2001, manufacturer recommends using Scan Tool VAG 1551/1552 or VAS 5051/5052. Starting with Model Year 2002 Golf and Jetta are equipped with Immobilizer Generation III (Starting 6/2001 for Beetle). Ignition keys for Immobilizer III may be marked "W3". For more reliable differentiation, always use the function "check control module version". Scan Tool VAS 5051 or 5052 must be used for Immobilizer Generation III diagnoses and coding. A correct Importer/Dealer number must reside in VAS 5051 or VAS 5052 in order to request a PIN number and to adapt Immobilizer Generation III.**

Authorized vehicle key required. Connect scan tool. Switch ignition on. Follow scan tool manufacturer's instructions for immobilizer adaptation to ECM.

NOTE: **Identity of ECM is read into the immobilizer control module next time ignition is switched on.**

DTC P1579/17987: THROTTLE VALVE CONTROL MODULE (J338) - ADAPTION NOT STARTED

NOTE: **This DTC may set if TVCM (J338) has been replaced, and not adapted to ECM.**

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Throttle Valve Control Module Adaption

TVCM (J338) adaptation must be performed when voltage supply to TVCM (J338) or ECM is lost. TVCM (J338) adaptation occurs:

- Automatically if ignition is switched on for 10 seconds or more, without operating accelerator pedal or starter and ECM recognizes a need for adaptation. No notification that adaptation was successful will be given when this happens.
- When initiated through diagnostic function 04 - BASIC SETTING in display group 060, (VAG 1551/1552 or VAS 5051/5052). Follow scan tool manufacturer's instructions.

1. **NOTE:** **Engine will not start during automatic adaptation. Ignition must remain on (engine off) for entire adaptation procedure. Ensure coolant temperature and intake air temperature are between 50-194° F (10-90° C). Battery voltage a minimum of 11.5 volts.**

   Connect scan tool to DLC. DLC is located on left side of steering column. Using scan tool check and clear any DTCs in memory. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** .
2.

NOTE: ECM will abort adaptation if: throttle valve cannot be closed completely (e.g. dirty throttle body, distorted throttle body or lose throttle body bolts), battery voltage is too low, engine is started or accelerator pedal is pressed during adaptation.

Using scan tool, follow scan tool manufacturer's instructions for TVCM (J338) adaptation. If you are using Scan Tool VAG 1551/1552 or VAS 5051/5052, from selection 1 enter diagnostic function 04 - BASIC SETTING. Follow scan tool instructions to enter diagnostic function 04 - BASIC SETTING function. Enter DISPLAY GROUP 060. Follow scan tool instructions for TVCM (J338) adaptation.

DTC P01602/18010: VOLTAGE SUPPLY TERMINAL 30 (B+) - VOLTAGE SUPPLY TOO LOW

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Test Procedure

NOTE: Manufacturer recommends using Scan Tool (VAG 1551/1552 or VAS 5051/5052). The following tests are preformed using Scan Tool (VAG 1551/1552 or VAS 5051/5052).

1. Ensure battery is okay. Ensure battery voltage is a minimum of 11.5 volts and all fuses are okay. Ensure battery and engine to body grounds are okay. Repair as necessary. Turn off all electrical consumers and A/C. Shift lever in park (A/T) or neutral (M/T) and set parking brake. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Start engine and idle.
2. Using scan tool. Read supply voltage for ECM. Voltage should be 12-14.5 volts. End scan tool data output. Turn ignition off. If voltage is less than 12V, go to next step. If voltage is more than 14.5 volts, go to step 4 . If voltage checks are okay. ECM power and ground circuits are okay. Test is complete.
3. Check battery, alternator, parasitic load and ECM grounds. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. If repairs where performed, repeat steps 1 and 2 . If battery, alternator, parasitic load and ECM grounds are okay, go to step 5 .
4. Possible cause is alternator and/or voltage regulator failure. Repair as necessary. If repairs were performed, repeat steps 1 and 2 . If alternator and voltage regulator are okay, go to next step.
5. Turn ignition off. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Go to next step.
6. **NOTE: If test box is not available. Use wiring diagram and DVOM to check ECM grounds and voltage supply, see appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.**

   Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and DVOM. Measure voltage supply at

test box sockets No. 1 and 62 (ground and B+ 30). Battery voltage should be present. Measure voltage supply at test box sockets No. 2 and 3 (ground and ignition 15). Battery voltage should be present. If either voltage tests have failed, for all models (except Beetle engine code AWV), go to next step. For Beetle (engine code AWV), go to step 8 . If both voltage checks are okay. ECM power and ground circuits are okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. On all models (except Beetle engine code AWV), check voltage supply through ECM power supply relay. Turn ignition on. Using adapter cables from Test Kit (VAG 1594) and a DVOM, measure voltage supply at test box sockets No. 2 and 121. Battery voltage should be present. Check continuity of wire from terminal No. 21 at ECM to ECM power supply relay No. 5, (No. 4 on relay for Passat). If any voltage tests have failed, go to next step. If voltage and continuity checks are okay. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
8. Check wiring connections on relay panel. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. Verify repairs. Test is complete. After reconnecting ECM, it is necessary to perform relearn procedure. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P01603/18011 & DTC P01604/18012

Code Definition

- DTC P01603/18011: ECM (J220) - Malfunction
- DTC P01604/18012: ECM (J220) - Malfunction

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below:

    - **Beetle**
      Turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect

harness connector. Remove ECM. Install ECM.

- **GTI and Jetta**
  Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

- **Passat**
  Turn ignition off. ECM is located at left rear of engine compartment. Remove ECM protective cover and retaining bracket. See **Fig. 7** . Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

4. After installing ECM perform following procedures:
   - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
   - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
   - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
   - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
   - On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
   - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
   - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
   - Perform idle check. See **IDLE CHECK** .
   - Generate ECM readiness code. See **READINESS CODE** .

DTC P1606/18014: POOR ROAD INFORMATION FROM ABS CONTROL MODULE (J104) - CIRCUIT MALFUNCTION

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: This code can be set while performing an emissions test where front wheels are rotated and rear wheels are stationary. Remove ABS control module fuse before performing this type of emissions test.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check ABS system for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between ABS control module and ECM for open or short. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1609/18017: CRASH SIGNAL FROM AIR BAG CONTROL MODULE (J234)

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Check Air Bag Control Module (J234) for DTC(s). See DIAGNOSTICS in appropriate AIR BAG RESTRAINT SYSTEMS article, under RESTRAINTS. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1610/18018: ECM (J220) - MALFUNCTION

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below:

    - **Beetle**
      Turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **GTI & Jetta**
      Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **Passat**
      Turn ignition off. ECM is located at left rear of engine compartment. Remove ECM protective cover and retaining bracket. See **Fig. 7** . Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.
4. After installing ECM perform following procedures:
    - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
    - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
    - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
    - On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
    - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .

- On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
- Perform idle check. See **IDLE CHECK** .
- Generate ECM readiness code. See **READINESS CODE** .

DTC P1612/18020: ECM (J220) - INCORRECTLY CODED

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

ECM Coding

Use scan tool to code ECM. See **ENGINE CONTROL MODULE (J220) CODING** .

DTC P1615/18023: OIL LEVEL SENSOR (G266) - IMPLAUSIBLE SIGNAL (PASSAT)

NOTE: DTC P1615/18023 is for Passat only.

Test Requirements

Ensure oil level is correct. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80°C).

Test Procedure

1. Check wiring between Oil Level Sensor (G266) and Instrument Cluster Control Module (J285), for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace faulty Oil Level Sensor (G266). After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1620/18028, DTC P1621/18029 & DTC P1622/18030

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1620/18028: ECT Sensor - Open Circuit/Short To B+
- DTC P1621/18029: ECT Sensor - Short To Ground
- DTC P1622/18030: ECT Sensor - Implausible Signal

Test Requirements

Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant system and engine coolant system thermostat are in good working order.

Test Procedure - (Beetle - Engine Code AWV)

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: Engine must be cold before performing test procedure.

NOTE: To bleed cooling system, fill cooling system. Warm engine to operating temperature, (run engine until coolant fan starts), do not allow engine to overheat, let engine cool and recheck coolant level.

1. Disconnect ECT sensor harness connector. See **Fig. 26** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals No. 1 and 3. See **Fig. 27** . See **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551) and (VAG 1552) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 26** . Using a jumper wire, bridge terminal with Brown/Blue wire and terminal No. 3 of ECT sensor harness connector. See **Fig. 28** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Disconnect ECT sensor harness connector. See **Fig. 26** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor harness connector. See **Fig. 26** . Using DVOM, measure resistance between ECT sensor harness connector terminal with Brown/Blue wire and test box socket No. 108. See **Fig. 28** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 3 and test box socket No. 93. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 108. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive and ground. Check Brown/Blue wire on ECT sensor harness connector for short circuit to B+. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

Test Procedure - (Beetle, GTI & Jetta - Engine Code AWP)

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: Engine must be cold before performing test procedure.

1. Disconnect ECT sensor harness connector. See **Fig. 29** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals C and D. See **Fig. 30** and **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan

tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.

3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551/1552) and (VAS 5051/5052) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 29** . Using a jumper wire, bridge terminal with Brown/Blue wire and terminal No. 3 of ECT sensor harness connector. See **Fig. 32** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Disconnect ECT sensor harness connector. See **Fig. 29** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor harness connector. See **Fig. 29** . Using DVOM, measure resistance between ECT sensor harness connector terminal with No. 3 and test box socket No. 93. See **Fig. 32** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 4 and test box socket No. 108. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 108. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive and ground. Check ECT sensor harness connector terminal No. 4 for short circuit to battery positive. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN**

PROCEDURE .

Test Procedure - Passat

WARNING: To avoid injury, allow cooling system to cool and carefully release system pressure.

NOTE: Engine must be cold before performing test procedure.

1. Disconnect ECT sensor harness connector. See **Fig. 31** . Using DVOM, measure resistance of ECT sensor between ECT sensor terminals "C" and "D". See **Fig. 30** . See **ECT SENSOR (G62) RESISTANCE** table. If ECT sensor resistance is okay, reconnect ECT sensor harness connector. Go to next step. If resistance is not okay, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Verify battery voltage is a minimum of 11.5 volts and all fuses are okay. Repair as necessary. Connect Scan Tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on. Using scan tool, check ECT sensor temperature value. If ECT sensor temperature value deviates greatly from ECT sensor ambient temperature, go to step 4 . If ECT sensor temperature value is approximately the same as ECT sensor ambient temperature, go to next step.
3. **NOTE: Next test step tests ECT sensor through its full range.**

   NOTE: Scan Tool (VAG 1551) and (VAG 1552) displays temperature in 1 to 1.5 degree increments. If engine does not run smoothly in certain temperature ranges and temperature value does not increase without interruption, signal is intermittent. ECT sensor must be replaced. After repairs, erase DTC memory.

   Start engine and idle. Using scan tool, observe ECT sensor temperature value. Temperature value should steadily increase. If ECT sensor temperature value did not steadily increase, replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
4. If ECT sensor temperature value is extremely high, approximately 285°F (141°C), possible cause is short to ground. Go to step 6 . If ECT sensor temperature value is extremely low, approximately -50°F (-46°C), possible cause is open circuit or short to positive. Go to next step.
5. Disconnect ECT sensor harness connector. See **Fig. 31** . Using a jumper wire, bridge terminals No. 3 and 4 of ECT sensor harness connector. See **Fig. 32** . Using scan tool, observe ECT sensor temperature value. If ECT sensor temperature value is approximately -50°F (46°C), turn ignition off. Go to step 7 . If ECT sensor temperature value is approximately 285°F (141°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Disconnect ECT sensor harness connector. See **Fig. 31** . Using scan tool, observe ECT sensor temperature value. If after disconnecting ECT sensor harness connector, temperature value is approximately 285°F (141°C), turn ignition off. Go to next step. If after disconnecting ECT sensor

harness connector, temperature value is approximately -50°F (-46°C), turn ignition off. Replace faulty ECT sensor. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

7. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Disconnect ECT sensor harness connector. See **Fig. 31** . Using DVOM, measure resistance between ECT sensor harness connector terminal with No. 3 and test box socket No. 108. See **Fig. 32** . Record resistance reading. Measure resistance between ECT sensor harness connector terminal No. 4 and test box socket No. 93. Record resistance reading. Resistance should be a maximum of 1.5 ohms for each reading. Go to next step.
8. Check ECT sensor harness connector terminal No. 3 for short circuit to test box socket No. 93. Check ECT sensor harness connector terminal No. 4 for short circuit to battery positive and ground. Check ECT sensor harness connector terminal No. 3 for short circuit to battery positive. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If wiring and ECT sensor are okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

ECT SENSOR (G62) RESISTANCE

Temperature °F (°C)	Ohms
86 (30)	1500-2000
104 (40)	1000-1500
122 (50)	800-1000
140 (60)	500-700
158 (70)	375-500
176 (80)	275-375
194 (90)	225-275

DTC P1624/18032: REQUEST FOR WARNING LAMP ON ACTIVE

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Transmission Control Module (J217) for DTCs. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1626/18034: DRIVETRAIN DATA BUS - NO SIGNAL FROM TRANSMISSION CONTROL MODULE (J217)

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

NOTE: **Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.**

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Transmission Control Module (J217) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Transmission Control Module (J217) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1628/18036: DRIVETRAIN DATA BUS - NO SIGNAL FROM STEERING ANGLE SENSOR (G85)

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

NOTE: **Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.**

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: **Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .**

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Steering Wheel Control Module (J453) DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Steering Angle Sensor (G85), Steering Wheel Control Module (J453) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1630/18038, DTC P1631/18039, DTC P1633/18041 & DTC P1634/18042

Code Definition

- DTC P1630/18038: Accelerator Pedal Position Sensor 1 (G79) - Signal Too Low
- DTC P1631/18039: Accelerator Pedal Position Sensor 1 (G79) - Signal Too High

- DTC P1633/18041: Accelerator Pedal Position Sensor 2 (G185) - Signal Too Low
- DTC P1634/18042: Accelerator Pedal Position Sensor 2 (G185) - Signal Too High

Circuit/Component Description

Accelerator Pedal Position (APP) sensor No. 1 (G79) and APP sensor No. 2 (G185) are located together as one unit in pedal assembly. APP sensors sense the position of the accelerator pedal, not throttle position.

When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) communicate driver's intentions to ECM, fully independent of each other. APP sensor No. 1 (G79) and APP sensor No. 2 (G185). All models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat, specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts), the larger the throttle opening the higher the percentage (voltage) reading. For all models, APP Sensor No. 2 (G185) ranges from 3-48 percent (0.15 to 2.40 volts), the larger the throttle opening the higher the percentage (voltage) reading.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for accelerator position sensors may not fully display on scan tool. Percentage (voltage) should always be twice as large for APP sensor No. 1 (G79) as the percentage (voltage) for APP sensor No. 2 (G185). No idle specifications for APP sensors are given by manufacturer.

1. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading on APP sensors No. 1 (G79) and No. 2 (G185).
2. Operate accelerator pedal slowly to wide open throttle and observe percentage (voltage) readings for APP sensor No. 1 (G79) and APP sensor No. 2 (G185). All models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat, specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts). All models, specification for APP sensor No. 2 (G185) is 3 to 48 percent (0.15 to 2.40 volts). If percentage (voltage) is not okay, go to next step. If percentage (voltage) is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Remove drive's side footwell cover and trim as necessary. Disconnect APP sensors 6-pin harness connector. Turn ignition on. Check voltage supply at 6-pin harness connector. See **Fig. 37** . See **APP SENSOR VOLTAGE SPECIFICATIONS** table. Turn ignition off. If no voltage is present, go to next step. If voltage tests are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR VOLTAGE SPECIFICATIONS

APP Sensor Harness Connector Terminals	Voltage
1 & Ground	Minimum 4.5
1 & 5	Minimum 4.5
2 & Ground	Minimum 4.5
2 & 3	Minimum 4.5

4.

NOTE: If accelerator pedal assembly is replaced, APP sensors must be adapted to the A/T control module.

NOTE: APP sensor harness connector terminal No. 5 is for A/T models only.

Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) or (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between APP sensor circuits and test box sockets. See **APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in APP sensor 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

APP Sensor 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	72
2	73
3	36
4	35
5	33
6	34

5. Replace faulty APP sensors No. 1 (G79) and No. 2 (G185). Accelerator position sensors are an integral part of the accelerator pedal assembly. After repairs, erase DTC memory. Adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1635/18043: DRIVETRAIN DATA BUS - NO SIGNAL FROM CLIMATE CONTROL MODULE (J255)

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in

SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

NOTE: Automatic A/C-Heater SysteM is referred to by Volkswagen as the Climatronic system and is a fully automatic climate control system.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Check Climate Control Module (J255) for DTC(s). See appropriate AUTOMATIC A/C-HEATER SYSTEM article, under HVAC. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Climate Control Module (J255) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1636/18044: DRIVETRAIN DATA BUS - NO SIGNAL FROM AIRBAG CONTROL MODULE

(J234)

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Check Air Bag Control Module (J234) for DTC(s). See DIAGNOSTICS in appropriate AIR BAG RESTRAINT SYSTEMS article, under RESTRAINTS. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Air Bag Control Module (J234) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1639/18047: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185) - IMPLAUSIBLE SIGNAL

Circuit/Component Description

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) are located together as one unit in pedal assembly. APP

sensors sense the position of the accelerator pedal, not throttle position.

When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) communicate driver's intentions to ECM, fully independent of each other. APP sensor No. 1 (G79) and APP sensor No. 2 (G185). All models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat, Specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts), the larger the throttle opening the higher the percentage (voltage) reading. For all models, APP Sensor No. 2 (G185) ranges from 3-48 percent (0.15 to 2.40 volts), the larger the throttle opening the higher the percentage (voltage) reading.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for accelerator position sensors may not fully display on scan tool. Percentage (voltage) should always be twice as large for APP sensor No. 1 (G79) as the percentage (voltage) for APP sensor No. 2 (G185). No idle specifications for APP sensors are given by manufacturer.

1. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading on APP sensors No. 1 (G79) and No. 2 (G185).
2. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for APP sensor No. 1 (G79) and APP sensor No. 2 (G185). All models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat, Specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts). All models, specification for APP sensor No. 2 (G185) is 3 to 48 percent (0.15 to 2.40 volts). If percentage (voltage) is not okay, go to next step. If percentage (voltage) is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Remove drive's side footwell cover and trim as necessary. Disconnect APP sensors 6-pin harness connector. Turn ignition on. Check voltage supply at 6-pin harness connector. See **Fig. 37** . See **APP SENSOR VOLTAGE SPECIFICATIONS** table. Turn ignition off. If no voltage is present, go to next step. If voltage tests are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR VOLTAGE SPECIFICATIONS

APP Sensor Harness Connector Terminals	Voltage
1 & Ground	Minimum 4.5
1 & 5	Minimum 4.5

2 & Ground	Minimum 4.5
2 & 3	Minimum 4.5

4.

NOTE: If accelerator pedal assembly is replaced, APP sensors must be adapted to the A/T control module.

NOTE: APP sensor harness connector terminal No. 5 is for A/T models only.

Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) or (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between APP sensor circuits and test box sockets. See **APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in APP sensor 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

APP Sensor 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	72
2	73
3	36
4	35
5	33
6	34

5. Replace faulty APP sensors No. 1 (G79) and No. 2 (G185). Accelerator position sensors are an integral part of the accelerator pedal assembly. After repairs, erase DTC memory. Adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1640/18048: ECM (J220) - MALFUNCTION

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM see specific model below:

    - **Beetle**
      Turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **GTI & Jetta**
      Turn ignition off. Remove wiper arms and cowl panel. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

    - **Passat**
      Turn ignition off. ECM is located at left rear of engine compartment. Remove ECM protective cover and retaining bracket. See **Fig. 7** . Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.

4. After installing ECM perform following procedures:
    - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
    - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
    - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
    - On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
    - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
    - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
    - Perform idle check. See **IDLE CHECK** .
    - Generate ECM readiness code. See **READINESS CODE** .

DTC P1648/18056: DRIVETRAIN DATA BUS MALFUNCTION

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all

wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Transmission Control Module (J217) and ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Transmission Control Module (J217), ABS Control Module (J104) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1649/18057: DRIVETRAIN DATA BUS - NO SIGNAL FROM ABS CONTROL MODULE (J104)

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

NOTE: **Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.**

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: **Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .**

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between ABS Control Module (J104) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1650/18058 & DTC P1654/18062

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

Code Definition

- DTC P1650/18058: Drivetrain Data Bus - No Signal From Instrument Cluster Control Module (J285)
- DTC P1654/18062: Check Instrument Cluster DTC Memory

NOTE: **Engine control module communicates with all control modules capable of transferring bus via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.**

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: **Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .**

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Instrument Cluster Control Module (J285) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Instrument Cluster Control Module (J285) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance

should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1676/18984, DTC P1677/18985, DTC P1678/18986 & DTC P1679/18987

Code Definition

- DTC P1676/18984: EPC Warning Light (K132) - Circuit Malfunction
- DTC P1677/18985: EPC Warning Light (K132) - Short To B+
- DTC P1678/18986: EPC Warning Light (K132) - Short To Ground
- DTC P1679/18987: EPC Warning Light (K132) - Open Circuit

Test Requirement

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

With key in the on position. If EPC warning light does not illuminate. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster for EPC warning light. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

If EPC warning light is illuminated with engine running, turn engine off. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster for EPC warning light. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

DTC P1681/18089: ECM (J220) - PROGRAMING NOT FINISHED (BEETLE)

NOTE: DTC P1681/18089 is for Beetle only.

NOTE: Before replacing ECM. Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all battery cable connections are okay and ECM connections are clean and tight.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine coolant temperature is at least 176° F (80°C).

Test Procedure

1. Check ECM ground and power supply. See **ECM GROUND & VOLTAGE SUPPLY** under ENGINE CONTROL MODULE (J220) - ME SFI CONTROL MODULE. If ECM ground and voltage supply are okay, go to next step. If ECM ground and voltage supply are not okay. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Replace ECM with known-good unit. Before disconnecting Engine Control Module (ECM - J220) record code and identification number from ECM that is to be replaced. See **ECM CODING** . Go to next step.
3. To remove ECM, turn ignition off. Move center dash panel forward and up. See **Fig. 6** . Remove center dash panel. Remove screw for left front dash cover. Lift cover at right side and pull to right to remove. Press retaining tab to left and pull ECM out. Release lock tab for harness connector and disconnect harness connector. Remove ECM. Install ECM.
4. After installing ECM perform following procedures:
    - Use scan tool to code new ECM. See **ENGINE CONTROL MODULE (J220) CODING** .
    - Use scan tool to check DTC memory, erase if necessary. See **CLEARING DIAGNOSTIC TROUBLE CODES** .
    - Perform adaptation of throttle valve control module. See **THROTTLE VALVE CONTROL MODULE (J338)** .
    - On vehicles equipped with cruise control, activate cruise control to ECM. See **ACTIVATING/DEACTIVATING CRUISE CONTROL** .
    - On vehicles equipped with A/T, perform adaptation of A/T to basic setting. See **A/T BASIC SETTING** .
    - On vehicles equipped with A/T, perform adaptation of kickdown switch. See **ADAPTING KICKDOWN FUNCTION** .
    - On vehicles equipped with factory alarm system, perform adaptation of immobilizer to ECM. See **IMMOBILIZER** .
    - Perform idle check. See **IDLE CHECK** .
    - Generate ECM readiness code. See **READINESS CODE** .

DTC P1682/18090: DRIVETRAIN DATA BUS - IMPLAUSIBLE SIGNAL FROM ABS CONTROL MODULE (J104)

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine control module communicates with all control modules capable of

transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between ABS Control Module (J104) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1683/18091: DRIVETRAIN DATA BUS - IMPLAUSIBLE SIGNAL FROM AIRBAG CONTROL MODULE (J234)

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: **Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.**

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: **Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .**

1. Check Air Bag Control Module (J234) for DTC(s). See DIAGNOSTICS in appropriate AIR BAG RESTRAINT SYSTEMS article, under RESTRAINTS. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Air Bag Control Module (J234) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1687/18095: DRIVETRAIN DATA BUS - IMPLAUSIBLE SIGNAL FROM CLIMATE CONTROL MODULE (J255)

NOTE: **If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .**

NOTE: **Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.**

NOTE: **Automatic A/C-Heater System is referred to by Volkswagen as the Climatronic system and is a fully automatic climate control system.**

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: **Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .**

1. Check Climate Control Module (J255) for DTC(s). See appropriate AUTOMATIC A/C-HEATER SYSTEM article, under HVAC. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Climate Control Module (J255) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1690/18098, DTC P1691/18099, DTC P1692/18100 & DTC P1693/18101

Code Definition

- DTC P1690/18098: MIL (K83) - Circuit Malfunction
- DTC P1691/18099: MIL (K83) - Open Circuit
- DTC P1692/18100: MIL (K83) - Short To Ground
- DTC P1693/18101: MIL (K83) - Short To B+

Test Requirement

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

With key in the on position. If MIL does not illuminate. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster MIL. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

If MIL is illuminated with engine running, turn engine off. Check for codes, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** , repair as necessary. If no DTCs are present, check wiring and instrument cluster MIL. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS.

DTC P1696/18104 & DTC P1699/18107

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Code Definition

- DTC P1696/18104: Data BUS - Implausible Signal From Steering Column Electronics
- DTC P1699/18107: Data BUS - No Signal From Steering Column Electronics

NOTE: Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of

the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check Steering Wheel Control Module (J453) DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between Steering Angle Sensor (G85), Steering Wheel Control Module (J453) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1853/18261: DRIVETRAIN DATA BUS - IMPLAUSIBLE SIGNAL FROM ABS CONTROL MODULE (J104)

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

NOTE: Engine control module communicates with all control modules capable of transferring data via a CAN (Controller Area Network) data bus. Data bus-

compatible control modules are connected together via two data bus wiring twisted together (CAN high and CAN low) and exchange information (messages). If information is not available in the CAN data bus from any one of the control modules in the CAN data bus system it will be recognized as a malfunction by the engine control module as well as other CAN data bus control modules. The CAN data bus requires a matching resistor to function fault-free. This central matching resistor is located in the engine control module.

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

NOTE: Instrument Cluster Control Module (J285) and Can Data Bus OBD Interface (J533) are integral parts of the instrument cluster. If instrument cluster is replaced, Can Data Bus OBD Interface (J533) must be coded. See CAN DATA BUS OBD INTERFACE (J533) CODING .

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check ABS Control Module (J104) for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check wiring between ABS Control Module (J104) and ECM (J220) for open or short circuits. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. See **Fig. 61** , **Fig. 62** and **Fig. 63** . If wiring is okay, go to next step. If wiring is not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Check centralized matching resistor in ECM. Turn ignition off. Connect ECM to test box, leave ECM harness connector disconnected from test box. Connect Test Box (VAG 1598/31). See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between test box sockets No. 58 and 60. Resistance should be 60-72 ohms. If resistance is not okay, replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P1912/18320 & DTC P1913/18321

Code Definition

- DTC P1912/18320: Brake Servo Pressure Sensor (G294) - Short To B+/Open Circuit
- DTC P1913/18321: Brake Servo Pressure Sensor (G294) - Short To Ground

Test Requirements

Ensure battery is okay. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off.

Test Procedure

1. Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, check brake system for DTCs. If no DTCs are present, go to next step. If DTC(s) are present, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. Check Brake Servo Pressure sensor (G294) harness connector and wiring. Brake Servo Pressure sensor is located at front of brake master cylinder. See appropriate WIRING DIAGRAM under ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS. Repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P2101/18533: THROTTLE VALVE CONTROL MODULE (J338) - MALFUNCTION

NOTE: If a test ends with ECM replacement. Before replacing ECM be certain that, all wiring, power and ground supplies are okay. See ENGINE PERFORMANCE in SYSTEM WIRING DIAGRAMS article in ELECTRICAL and ECM GROUND & VOLTAGE SUPPLY .

Circuit/Component Description

Throttle Valve Control Module (TVCM - J338) is located on throttle body. Throttle valve drive angle sensors and are located in TVCM (J338). ECM monitors throttle valve drive angle sensors for throttle valve position. ECM calculates throttle position based on percentage values sent by throttle valve drive angle sensors. Throttle valve drive angle sensors run in opposite directions of each other. Throttle Valve Drive Angle sensor No. 1 (G187) displays throttle positions from 3-97 percent. Throttle Valve Drive Angle sensor No. 2 (G188) displays throttle positions from 97-3 percent. Throttle Valve Drive Angle sensor No. 1 (G187) ranges from 3-93 percent (0.15-4.65 volts), the larger the throttle opening the higher the percentage (voltage) reading. Throttle Valve Drive Angle sensor No. 2 (G188) ranges from 97-3 percent (4.90-0.15 volts), the larger the throttle opening the smaller the percentage (voltage) reading. When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for throttle valve drive angle sensors may not fully display on scan

tool. No idle specifications for throttle valve drive angle sensors are given by manufacturer.

1. Turn ignition off. Disconnect TVCM (J338) 6-pin harness connector. Using DVOM check resistance between terminals No. 3 and 5 on TVCM. See **Fig. 20** . Specification is one to 5 ohms. If resistance is okay, go to next step. If resistance is not okay, replace faulty TVCM. Erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220), see **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217), see **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
2. **NOTE: If TVCM (J338) is replaced it must be adapted to the ECM and A/T control module (if equipped).**

   Connect scan tool. See **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188).
3. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for Throttle Valve Drive Angle sensor No. 1 (G187) and Throttle Valve Drive Angle sensor No. 2 (G188). Specification for Throttle Valve Drive Angle sensor No. 1 (G187) is 3 to 93 percent (0.15 to 4.65 volts). Specification for Throttle Valve Drive Angle sensor No. 2 (G188) is 97 to 3 percent (4.90 to 0.15 volts). If throttle valve drive angle sensor tests are not okay, go to step 6 . If throttle valve drive angle sensor tests are okay, go to next step.
4. Check APP sensors. See **DTC P0226/16610: ACCELERATOR PEDAL POSITION SENSOR 1 (G79) ACCELERATOR PEDAL POSITION SENSOR 2 (G185), IMPLAUSIBLE SIGNAL** . If APP sensors are not okay, go to next step. If APP sensors are okay. Erase DTC memory. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** . If code did not return on test drive, test is complete.
5. Replace APP sensors. Erase DTC memory. Verify repair. Test is complete. For vehicles with A/T, adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
6. Turn ignition off. Disconnect ECM harness connector. Leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between TVCM (J338) 6-pin harness connector and test box sockets, see **TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in TVCM (J338) 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s) as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

TVCM (J338) 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

TVCM 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	92

2	83
3	117
4	84
5	118
6	91

7. Turn ignition on. Using DVOM, measure voltage between TVCM (J338) 6-pin harness connector specified terminals. See **TVCM (J338) VOLTAGE SPECIFICATIONS** table. See **Fig. 33** . Record voltage readings. If voltage readings are not okay, go to next step. If voltage readings are okay, resistance measurements are okay and no short circuits exist, replace faulty TVCM. After repairs, erase DTC memory. Verify repair. Test is complete. Adapt TVCM (J338) to ECM (J220). See **THROTTLE VALVE CONTROL MODULE (J338)** . For vehicles with A/T, adapt TVCM (J338) to Transmission Control Module (J217). See **A/T BASIC SETTING** . On all models, perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

   TVCM (J338) VOLTAGE SPECIFICATIONS

TVCM 6-Pin Harness Connector Terminals	Voltage
2 & Ground	Minimum 4.5
2 & 6	Minimum 4.5

8. Check ECM voltage supply. See **ECM GROUND & VOLTAGE SUPPLY** under ECM (J220) - ME SFI CONTROL MODULE. If ECM ground circuits and ECM voltage supply are okay, go to next step. If ECM ground circuits and/or ECM voltage supply are not okay, repair as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
9. Replace faulty ECM. See **ENGINE CONTROL MODULE REMOVAL & INSTALLATION** . Erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

DTC P2122/18554, DTC P2127/18559, DTC P2128/18560 & DTC P2138/18570

Code Definition

- DTC P2122/18554: Accelerator Pedal Position Sensor 1 (G79) - Signal Too Low
- DTC P2127/18559: Accelerator Pedal Position Sensor 2 (G185) - Signal Too Low
- DTC P2128/18560: Accelerator Pedal Position Sensor 2 (G185) - Signal Too High
- DTC P2138/18570: Accelerator Pedal Position Sensor 1 (G79) - Accelerator Pedal Position Sensor 2 (G185), Implausible Signal

Circuit/Component Description

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) are located together as one unit in pedal assembly. APP sensors sense the position of the accelerator pedal, not throttle position.

When the engine is running (under load) the ECM can operate throttle valve independently of driver input.

APP sensor No. 1 (G79) and APP sensor No. 2 (G185) communicate driver's intentions to ECM, fully independent of each other. APP sensor No. 1 (G79) and APP sensor No. 2 (G185). On all models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat models, specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts), the larger the throttle opening the higher the percentage (voltage) reading. For all models, APP Sensor No. 2 (G185) ranges from 3-48 percent (0.15 to 2.40 volts), the larger the throttle opening the higher the percentage (voltage) reading.

Test Requirements

Ensure throttle valve is not damaged or dirty. Ensure all fuses are okay, battery voltage is at least 11.5 volts and fuel pump relay is okay. Ensure all electrical accessories are off and A/C is off. Ensure engine is mechanically sound. Ensure no intake or exhaust system leaks exist. Ensure engine coolant temperature is at least 176°F (80° C).

Test Procedure

NOTE: Test ranges for accelerator position sensors may not fully display on scan tool. Percentage (voltage) should always be twice as large for APP sensor No. 1 (G79) as the percentage (voltage) for APP sensor No. 2 (G185). No idle specifications for APP sensors are given by manufacturer.

1. Connect scan tool, see **RETRIEVING DIAGNOSTIC TROUBLE CODES** . Turn ignition on, engine off. Following scan tool manufacturer's instructions, observe percentage reading on APP sensors No. 1 (G79) and No. 2 (G185).
2. Operate accelerator pedal slowly to Wide Open Throttle and observe percentage (voltage) readings for APP sensor No. 1 (G79) and APP sensor No. 2 (G185). All models except Passat, specification for APP sensor No. 1 (G79) is 6 to 96 percent (0.30 to 4.8 volts). For Passat, Specification for APP sensor No. 1 (G79) is 12 to 97 percent (0.60 to 4.9 volts). All models, specification for APP sensor No. 2 (G185) is 3 to 48 percent (0.15 to 2.40 volts). If percentage (voltage) is not okay, go to next step. If percentage (voltage) is okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .
3. Turn ignition off. Remove drive's side footwell cover and trim as necessary. Disconnect APP sensors 6-pin harness connector. Turn ignition on. Check voltage supply at 6-pin harness connector. See **Fig. 37** . See **APP SENSOR VOLTAGE SPECIFICATIONS** table. Turn ignition off. If no voltage is present, go to next step. If voltage tests are okay, erase DTC memory. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR VOLTAGE SPECIFICATIONS

APP Sensor Harness Connector Terminals	Voltage
1 & Ground	Minimum 4.5
1 & 5	Minimum 4.5
2 & Ground	Minimum 4.5
2 & 3	Minimum 4.5

4.

NOTE: If accelerator pedal assembly is replaced, APP sensors must be adapted to the A/T control module.

NOTE: APP sensor harness connector terminal No. 5 is for A/T models only.

Turn ignition off. Disconnect ECM harness connector, leave ECM disconnected from test box. Connect Test Box (VAG 1598/31) or (VAG 1598/22) to ECM harness connector. See **CONNECTING VAG TEST BOX** . Using DVOM, check resistance between APP sensor circuits and test box sockets. See **APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION** table. Record resistance readings. Resistance should be a maximum of 1.5 ohms for each reading. Check wiring in APP sensor 6-pin harness connector for short circuits to one another, and for short circuits to B+ and ground. If resistance measurements are okay and no short circuits exist, go to next step. If any resistance measurement is not okay, or a short circuit exists, repair circuit(s), as necessary. After repairs, erase DTC memory. Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

APP SENSOR 6-PIN HARNESS CONNECTOR/VAG TEST BOX SOCKET IDENTIFICATION

APP Sensor 6-Pin Harness Connector Terminal	VAG Test Box Socket
1	72
2	73
3	36
4	35
5	33
6	34

5. Replace faulty APP sensors No. 1 (G79) and No. 2 (G185). Accelerator position sensors are an integral part of the accelerator pedal assembly. After repairs, erase DTC memory. Adapt APP sensors to Transmission Control Module (J217). See **A/T BASIC SETTING** . Verify repair. Test is complete. Perform ECM relearn procedure. See **TEST DRIVE RELEARN PROCEDURE** .

ST GENERAL SCAN TOOL

GENERAL INFORMATION FOR ON BOARD DIAGNOSTIC (OBD)

Characteristics of On Board Diagnostic (OBD)

The Engine Control Module (Motronic Engine Control Module (ECM) -J220-) is equipped with DTC memory.

If malfunctions occur at the exhaust relevant systems or components, they are stored in DTC memory with a description of the malfunction type.

The Engine Control Module (ECM) differentiates between different DTCs after evaluating the information, see **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:**

The stored malfunctions can be checked with a standard diagnostic tester, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again, see **READINESS CODE, GENERATING** .

The following work steps must be performed in the described sequence after the malfunction(s) have been repaired:

1. - Check DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
2. - Erase DTC memory, see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
3. - For completion, generate readiness code, see **READINESS CODE, GENERATING** .

On Board Diagnostic (OBD), technical data

Control module identification

The control module version is displayed by selecting "Diagnostic mode 9: Vehicle information" under address word 33, see **DIAGNOSTIC MODE 9: VEHICLE INFORMATION** .

Engine Control Module (ECM) equipment

ENGINE CONTROL MODULE (ECM) EQUIPMENT DESCRIPTION

Engine code	APH	AWP	AWV
System identification	Motronic ME7.5	Motronic ME7.5	Motronic ME7.5

Terminals at Engine Control Module (ECM)	121	121	121
Emissions limiting values according to	TLEV(1)	LEV(2)	LEV(2)
On Board Diagnostic (OBD)	OBD II	OBD	II OBD II
DTC memory	Permanent memory (3)	Permanent memory (3)	Permanent memory (3)
Memory for adaptation values	Temporary memory (4)	Temporary memory (4)	Temporary memory (4)
Oxygen sensor control	2 sensors	2 sensors	2 sensors
Knock sensor control	2 knock sensors	2 knock sensors	2 knock sensors
Intake manifold change-over	No	No	No
Camshaft adjustment	No	Yes	Yes
Boost pressure regulation	Yes	Yes	Yes
Secondary Air Injection (AIR) system	Yes	Yes	Yes
Electronic engine performance regulation	Yes	Yes	Yes

(1) TLEV = Transient Low Emission Vehicles (emission values max. 0.125 g/mi HC)

(2) LEV = Low Emission Vehicles (emission values max. 0.075 g/mi HC)

(3) Independent of voltage supply.

(4) Values are erased when voltage supply is interrupted.

Selectable diagnostic modes under address word 33 - OBD

NOTE: The conditions required for selecting the desired diagnostic mode are listed in the SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD table.

SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD

Diagnostic mode			**Requirement:**		
Selectable diagnostic modes under address word 33 - OBD			• engine off • Ignition switched on.	• Engine running at idle	• Vehicle in drive mode
Mode 1:	Check measured values	See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES**	Yes	Yes	Yes
Mode 2:	Checking operating conditions	See **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS**	Yes	Yes	Yes

Mode 3:	Check DTC Memory	See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY**	Yes[1)]	Yes	Yes
Mode 4:	Reset/erase diagnostic data	See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA**	Yes	Yes	Yes
Mode 5:	Check output of oxygen sensor signals	See **DIAGNOSTIC MODE 5: CHECK OUTPUT OF OXYGEN SENSOR SIGNALS**	Yes	Yes	Yes
Mode 6:	Check test results of components that are not continuously monitored	See **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**	No	Yes	Yes
Mode 7:	Check test results of components that are continuously monitored	See **DIAGNOSTIC MODE 7: CHECK TEST RESULTS OF COMPONENTS THAT ARE CONTINUOUSLY MONITORED**	Yes[(1)]	Yes	Yes
Mode 8:	Tank leak test	See **DIAGNOSTIC MODE 8: TANK LEAK TEST**	No	Yes	No
Mode 9:	Vehicle information	See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION**	Yes	Yes	Yes

(1) Perform only with ignition switched on when engine does not start (operate starter beforehand for at least 6 seconds).

Connect diagnostic tester

Recommended special tools and equipment.:

- VAS 5052 Vehicle Diagnostic and Information System with
- VAS 5052/3 diagnostic cable

Requirements

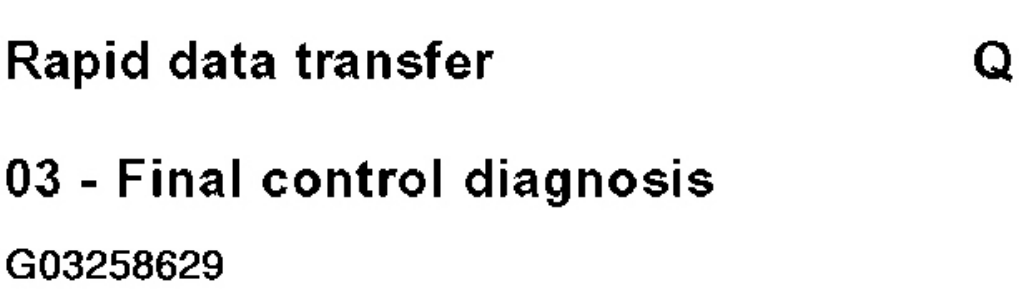


Fig. 1: Identifying VAS 5052 Vehicle Diagnostic And Information System
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- The respective fuses of the Motronic fuel injection and ignition system must be OK. Fuse holder is located behind access panel at far left end of dash.

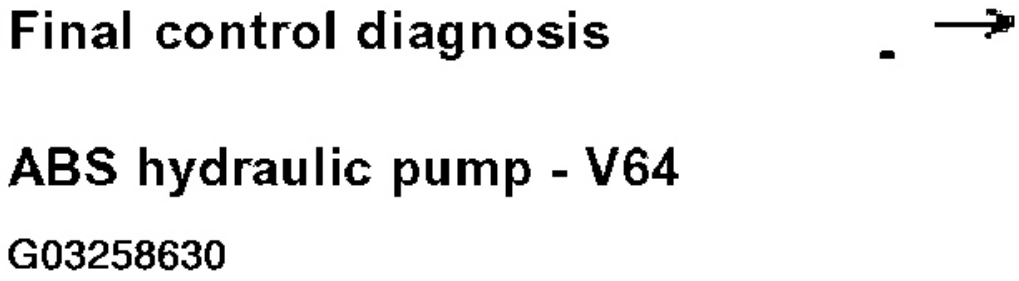


Fig. 2: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- For vehicles with automatic transmission, selector lever must be in position -P- or -N-.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Ignition switched off.

Work procedure

Connect diagnostic tester (VAS 5052) using (VAS 5052/3) diagnostic cable as follows:

- Connect diagnostic cable connector to Data Link Connector (DLC) -arrow-.

Fig. 3: Identifying Data Link Connector (DLC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Depending on the desired diagnostic mode, it is necessary to:switch on ignition

or start engine, see **SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD** .

NOTE:

- **Respective operation of the diagnostic tester:**

  See Operating instructions of the diagnostic tester

- **If no display appears on diagnostic tester, check voltage supply at Diagnostic Link Connector (DLC).**

Connect test box for wiring test

Recommended special tools and equipment

- VAG1598/31 test box

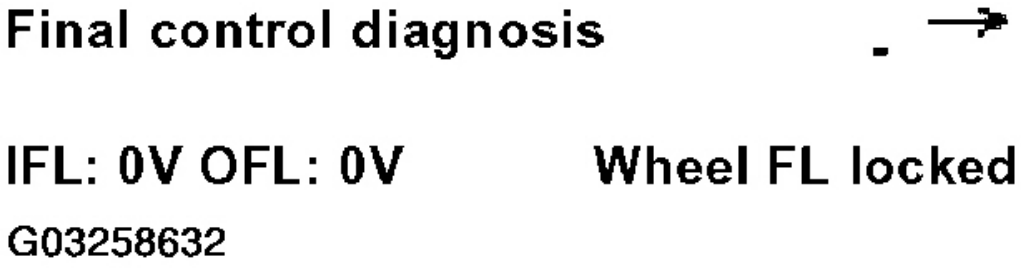


Fig. 4: Identifying VAG1598/31 Test Box
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Requirement

- Ignition switched off.

Work procedure

- Remove inner cover, left plenum chamber, to do this, slide center cover -1- of plenum chamber forward out of catch and remove from instrument panel.

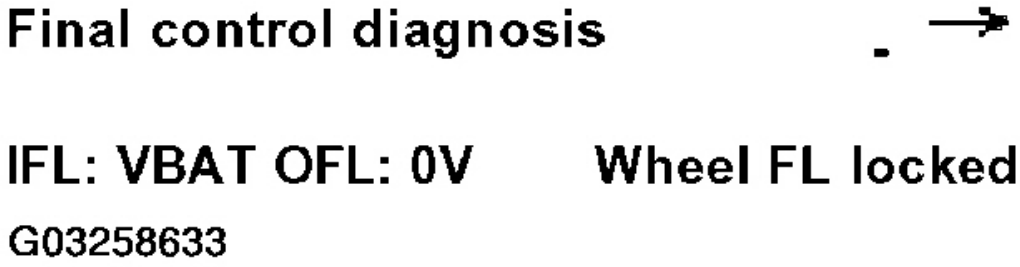


Fig. 5: Removing Inner Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove three bolts -1-.

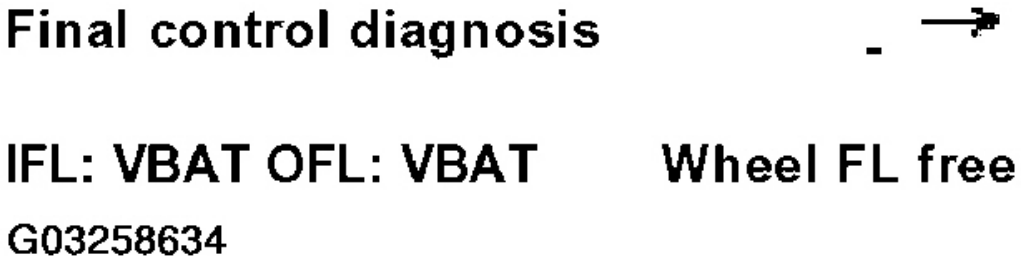


Fig. 6: [Removing Three Bolts]
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lift left cover -1- of plenum chamber in center of instrument panel (arrow A) and thereby unclip (front edge clips, rear edge clamps).
- Pull cover -1- toward vehicle center out of bracket underneath Apillar (arrow B).
- Then disengage connector from control module and disconnect.

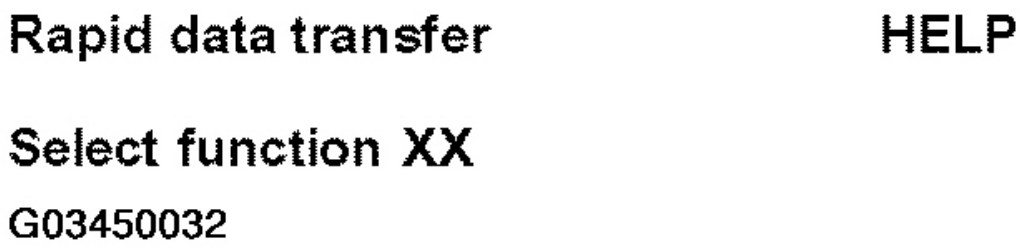


Fig. 7: Pulling Cover Toward Vehicle Center Out Of Bracket Underneath A Pillar
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect VAG1598/31 test box at control module wiring harness. Engine Control Module (ECM) is not connected.

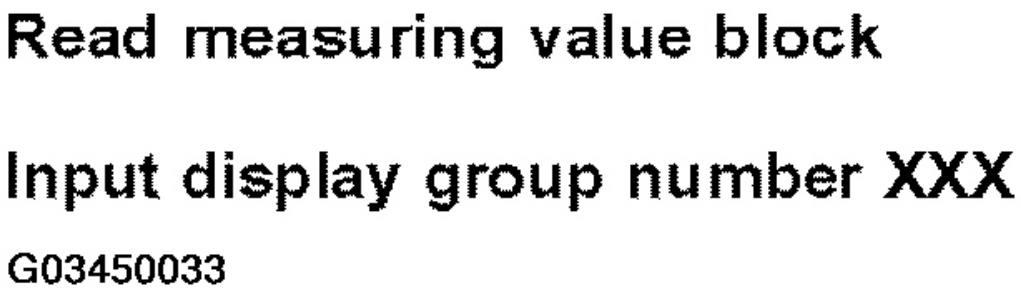


Fig. 8: Connecting VAG1598/31 Test Box At Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again, see **READINESS CODE, GENERATING** .

Check Malfunction Indicator Lamp (MIL) in instrument cluster

Meaning of exhaust MIL

The Malfunction Indicator Lamp (MIL) lights up when exhaust relevant malfunctions are recognized by the Engine Control Module (ECM).

Component location of exhaust MIL

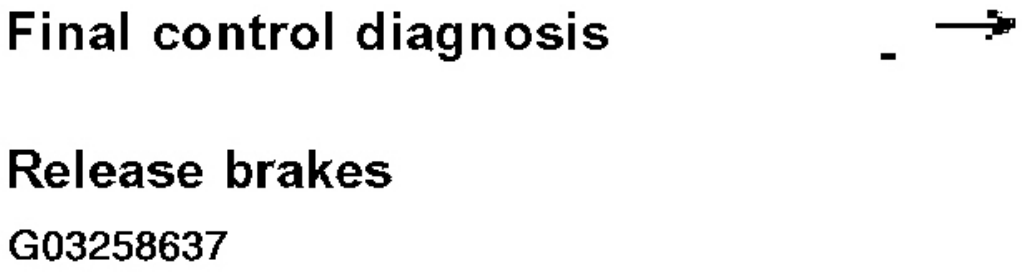


Fig. 9: Identifying ECM Harness Connector Terminals

Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The Malfunction Indicator Lamp (MIL) can blink or remain lit continuously. DTC memory must be checked in each case, see DIAGNOSTIC MODE 3: CHECK DTC MEMORY .

- Blinking: There is a malfunction that causes damage to the catalytic converter in this driving condition. In this case, vehicle must only be driven at reduced performance!
- Continuously lit: There is a malfunction that causes increased emissions. Check DTC memory for Motronic control module.
- DTC memory must still be checked if there are drivability problems or customer complaints and the MIL is not lit, since malfunctions can be stored without causing the MIL to light immediately.

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirement

- The respective fuses of Malfunction Indicator Lamp (MIL) -K83- must be OK. Fuse holder is located behind access panel at far left end of dash.

Fig. 10: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Test sequence

- Switch on ignition:

exhaust MIL must light up.

If exhaust MIL does not light up when ignition is switched on:

- Switch ignition off.
- Check wire from ECM to exhaust MIL as follows:
- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Bridge sockets 2+47 of test box with the respective adapter cables.
- Switch on ignition:

exhaust MIL must light up.

If Malfunction Indicator Lamp (MIL) does not light up:

- Switch ignition off.
- Remove instrument cluster:

  See **INSTRUMENT CLUSTER, REMOVING AND INSTALLING**

- Check wire connection from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL) -K83- according to wiring diagram.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

  If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)** .

If exhaust MIL lights up when ignition is switched on:

- Start engine and let run at idle:

  Exhaust MIL must

  go out after a few seconds.

  If Malfunction Indicator Lamp (MIL) does not go out:

- Switch ignition off.
- Remove instrument cluster:

See **INSTRUMENT CLUSTER, REMOVING AND INSTALLING**

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Check wire connection between test box socket 47 and instrument cluster for short circuit to Ground (GND) according to wiring diagram.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)** .

SELECT DIAGNOSTIC MODE

Recommended special tools and equipment:

- VAS 5052 Vehicle Diagnostic and Information System with
- VAS 5052/3 diagnostic cable

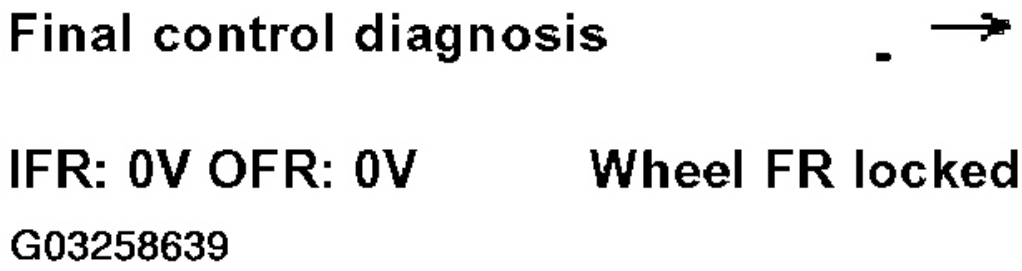


Fig. 11: Identifying VAS 5052 Vehicle Diagnostic And Information System
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Address word 33 - On-Board Diagnostic (OBD)

Function

Via the diagnostic tester, different diagnostic modes can be selected under "address word 33 - On-Board Diagnostic (OBD)".

The following diagnostic modes monitor all components and systems which influence the emission quality.

Diagnostic mode 1: Check measured values

Requirement

- Coolant temperature must be at least 80 °C, see PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition:switch on ignition

  or start engine and let run at idle.

- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- Select the desired measured values "PID XX".

NOTE:

- **The specified values for the respective measuring values can be found at the respective component- and function tests.**
- **The following list only serves as an overview.**
- **The measuring values are sorted according to the PID (parameter - identifications).**

DIAGNOSTIC MODE 1: CHECK MEASURED VALUES

PID	Display measuring values
01:	Monitoring status since erasing DTC memory
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline -air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Valve timing adjustment at 1. cyl. to "advance"
15:	Intake Air Temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)

DIAGNOSTIC MODE 1: CHECK MEASURED VALUES

PID	Display measuring values
18:	Availability status of secondary air
19:	Component location of oxygen sensors

21:	Bank 1 - sensor 2
28:	OBD requirement for which this vehicle is equipped
52:	Sensor current bank 1 sensor 1

- End diagnosis and switch ignition off.

Diagnostic mode 2: Checking operating conditions

Function

This diagnostic mode displays the operating conditions at which an emission relevant malfunction was detected and stored by the Engine Control Module (ECM).

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition:switch on ignition

  or start engine and let run at idle.

- Under address word 33, select "Diagnostic mode 2: Check operating conditions."
- Select the desired operating condition "PID XX".

NOTE: The operating conditions are sorted by the PID (parameter-identifications).

DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS

PID	Display operating conditions
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline -air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed

- End diagnosis and switch ignition off.

Diagnostic mode 3: Check DTC Memory

Function

This diagnostic mode indicates all stored DTCs of components and systems which are emission relevant.

Malfunction Indicator Lamp (MIL) in instrument cluster lights up for a DTC entry.

SAE Diagnostic Trouble Codes (DTCs)

The DTC always consists of a 5-digit alphanumeric value with the following meaning:

Component group:

- Pxxxx = DTC for drivetrain.

  Norm-Code:

- P0xxx = DTCs defined by SAE with specified malfunction texts.
- P1xxx = additional emission relevant DTCs provided by manufacturer.

- P2xxx = DTCs defined by SAE with specified texts, from MY 2000
- P3xxx = additional emissions relevant DTCs provided by manufacturer from MY 2000.

  System group:

- Px0xx = Fuel -air mixture and additional emission regulations
- Px1xx = Fuel and air ratio.
- Px2xx = Fuel and air ratio.
- Px3xx = Ignition system.
- Px4xx = additional emission regulation.
- Px5xx = Speed and idle control.
- Px6xx = Control module and output signals.
- Px7xx = Transmission.
- Px8xx = Transmission.
- Px9xx = Control modules, input and output signals.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- **Operate starter for approx. 6 seconds. Do not switch ignition off afterward.**

- Under address word 33, select "Diagnostic mode 3:, Check DTC memory."

  The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.

- Repair stored malfunctions according to DTC table:
  - SAE P0xxx-DTCs, see **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:** .
  - SAE P1xxx-DTCs, see **SAE P1XXX-DTCS** .
  - SAE P2xxx-DTCs, see **SAE P2XXX-DTCS** .
  - SAE P3xxx-DTCs, see **SAE P3XXX-DTCS** .
- Erase DTC memory, see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

NOTE:

- **The DTC table is sorted by SAE codes.**

- *"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.*
- *"Emission"-relevant malfunctions are additionally indicated in the instrument cluster via the Malfunction Indicator Lamp (MIL).*
- In Diagnostic mode 2, it can be determined at which operating condition a malfunction was detected and stored by the Engine Control Module (ECM), see **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS** .
- Erase DTC memory after repairing malfunction, see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

Display example:

P0444Evaporative Emission System Purge Control Valve Circuit Open

Explanation:

- P0444 = SAE diagnostic trouble code (malfunction identification number).
- Evaporative Emission System Purge Control Valve = malfunctioning wiring path or malfunctioning component.
- Circuit Open = Malfunction type as text

Diagnostic mode 4: Reset/erase diagnostic data

Function

This diagnostic mode performs the following functions:

- all emission relevant malfunctions in DTC memory will be erased,
- the operating conditions at which a malfunction was stored will be reset, see **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS** .
- all adaptation values are being reset,
- all test results of the diagnostic functions are being reset.

Requirement

- DTC memory was checked, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 4: Reset/erase diagnostic data."

Erased or reset:

- Number and content of the DTC memories,
- Operating conditions,
- Adaptation values,
- Test results.

- End diagnosis and switch ignition off.
- Generate readiness code, see **READINESS CODE, GENERATING** .

Diagnostic mode 5: Check output of oxygen sensor signals

Function

The static values of the oxygen sensors are indicated via this diagnostic mode.

The values of the individual oxygen sensor signal outputs must reach the specified value or must be within the min.- and max.- limits.

Requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 5: Check output of oxygen sensor signals".
- Select the desired output of oxygen sensor signals "Test -ID XX".

Evaluation of output of oxygen sensor signals:

- Test-ID 01 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 02 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 07 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 08 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 129 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 130 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 131 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 132 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**

- End diagnosis and switch ignition off.

Evaluation test-ID 01 Bank 1 Sensor 2: rich to lean sensor barrier voltage

EVALUATION TEST-ID 01 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	max.
Fixed value: 0.652 V	

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- Bank 1, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 10.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 02 Bank 1 Sensor 2: lean to rich sensor barrier voltage

EVALUATION TEST-ID 02 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
Fixed value: 0.652 V	

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- Bank 1, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 10.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 07 Bank 1 Sensor 2: Minimum voltage at sensor for test cycle

EVALUATION TEST-ID 07 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.000	V 0.400 V

If the specified value is not reached:

- Short circuit to Ground (GND) in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:
  - Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
- Short circuit to B+ or open circuit in wiring in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 08 Bank 1 Sensor 2: Maximum voltage at sensor for test cycle

EVALUATION TEST-ID 08 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.500	V 1.053 V

If the specified value is not reached:

- Oxygen sensor not ready for operation

- Oxygen sensor heater faulty:
- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
- Short circuit to Ground (GND) or open circuit in wiring in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Short circuit to B+ in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 129 Bank 1 Sensor 1: Actual value of oxygen sensor voltage

EVALUATION TEST-ID 129 BANK 1 SENSOR 1: OXYGEN SENSOR VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.700	1.992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 130 Bank 1 Sensor 1: Control barrier voltage

EVALUATION TEST-ID 130 BANK 1 SENSOR 1: CONTROL BARRIER VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.700	1.992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 131 Bank 1 Sensor 1: Dynamic value

EVALUATION TEST-ID 131 BANK 1 SENSOR 1: DYNAMIC VALUE SPECIFICATION

Specified value:	
min.	**max.**
0.00	4.0

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 132 Bank 1 Sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2)

EVALUATION TEST-ID 132 BANK 1 SENSOR 1: OXYGEN SENSOR SPECIFIED VALUE

Specified value:	
min.	**max.**
-0.05	0.05

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Diagnostic mode 6: Check test results of components that are not continuously monitored

Function

This diagnostic mode displays the test results of emission relevant components and systems which are not continuously monitored.

The values of the individual test results must reach the specified value or must be within the min.- and max. -limits.

DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS

Test-ID	Component, System	Test
01:	Catalytic converter	See **TEST REQUIREMENTS**
03:	Secondary Air Injection (AIR) system	See **TEST REQUIREMENTS**
05:	Tank ventilation system	See **TEST REQUIREMENTS**
09:	Engine Coolant Temperature (ECT) Sensor -G62-	See **TEST REQUIREMENT**

Test-ID 01: Catalytic converter

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Read readiness code, see **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 01: Catalytic converter".
- Check specified values at idle.

Evaluation test-ID 01:

EVALUATION TEST-ID 01: SPECIFIED VALUE SPECIFICATION

	Vehicles with engine code APH		Vehicles with engine code AWP, AWV	
	Specified value:		Specified value:	
Catalytic converter	min.	max.	min.	max.
• Catalytic converter monitoring bank 1, aging value	0.0977	0.3320	0.1992	0.2500
• Catalytic converter monitoring bank 1, aging value, short test	-	0.3789	-	0.3516

- End diagnosis and switch ignition off.

If the specified values are exceeded:

- Replace the front exhaust pipe with catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 4.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Test-ID 03: Secondary Air Injection (AIR) system

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Read readiness code, see **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 03: Secondary Air Injection (AIR) system"
- Check specified values at idle.

Evaluation test-ID 03:

EVALUATION TEST-ID 03: SPECIFIED VALUE SPECIFICATION

Secondary Air Injection (AIR) system	Vehicles with engine code APH		Vehicles with engine code AWP, AWW	
	Specified value:		Specified value:	
	min.	max.	min.	max.
• reduced secondary air mass bank 1	0.5	-	0.4530	-
• very small secondary air mass bank 1, short test	0.102	-	0.3984	-
• Leakage bank 1, short test	-	14.0 kg/h	-	2.0 kg/h

- End diagnosis and switch ignition off.

  If the specified values are not reached:

- Check secondary air system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** .
- Check combination valve, see **COMBINATION VALVE, CHECKING** .
- Check Secondary Air Injection (AIR) Pump Motor -V101-, see **SECONDARY AIR INJECTION**

(AIR) PUMP MOTOR, CHECKING .

- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Test-ID 05: Tank ventilation system

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Read readiness code, see **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 05: Tank ventilation system".
- Check specified values at idle.

Evaluation test-ID 05:

EVALUATION TEST-ID 05: SPECIFIED VALUE SPECIFICATION

Tank ventilation system	Specified value:	
Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-	**min.**	**max.**
• Passive test (can only check OK)	0.1484	-
• Active test: Deviation of oxygen sensor control in direction "lean" (can only check OK), short test	0.070	-
• Active test: Deviation of oxygen sensor control in direction "rich" (can only check OK), short test	-0.070	-
• Active test: Air balance at idle OK, also short test	30%	-
• Active test: Air balance at idle not OK, also short test	30%	-

EVALUATION TEST-ID 05: SPECIFIED VALUE SPECIFICATION

Tank ventilation system	Vehicles with engine code APH		Vehicles with engine code AWP, AWW	
	Specified value:		Specified value:	
Tank seal	**min.**	**max.**	**min.**	**max.**

• Large/small leak	1.6..1.90	-	1.65...1.90	-
• Reed contact not closed	-	0.5/s	-	0.5/s
• Reed contact does not open	-	25	-	30
• Tank ventilation system not OK during initial flush	30	-	0	-

If the specified values are exceeded:

- EVAP canister system, checking for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak detection pump (LDP) -V144-, checking, see **CHECK LEAK DETECTION PUMP (LDP)** .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Test-ID 09: Engine Coolant Temperature (ECT) Sensor -G62-

Test requirement

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test until a coolant temperature of 80 to 100 °C has been reached, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Observe the safety precautions that apply to road tests, see **SAFETY PRECAUTIONS** .

- Switch ignition off.
- Start engine at a coolant temperature of 80 to 90 °C and let it run at idle.
- Perform a 5 minute road test in the highest gear or in the highest driving mode on a level driving surface.
- The following operating conditions must be met during this road test:

- Engine speed approx. 1800 to 2200 RPM, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 12, engine rotations per minute (RPM)
- Vehicle speed constant 90 km/h, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 13, Vehicle speed

Observe the safety precautions that apply to road tests, see **SAFETY PRECAUTIONS** .

- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 09: Engine Coolant Temperature (ECT) sensor".
- Check specified values at idle.

Evaluation test-ID 09:

EVALUATION TEST-ID 09: SPECIFIED VALUE SPECIFICATION

	Specified value:	
Engine Coolant Temperature (ECT) Sensor -G62-	**min.**	**max.**
• Coolant temperature	80.3 °C	115 °C

If specified value is not obtained:

- Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING**
- Check coolant regulator:

  See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**

- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Diagnostic mode 7: Check test results of components that are continuously monitored

Function

This diagnostic mode indicates all stored DTCs of components and systems which are continuously monitored.

Requirement

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- **Operate starter for approx. 6 seconds. Do not switch ignition off afterward.**

- Under address word 33, select "Diagnostic mode 7: Check test results of components that are continuously monitored".

The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.
- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs, see **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:** .
- SAE P1xxx-DTCs, see **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs, see **SAE P2XXX-DTCS** .
- SAE P3xxx-DTCs, see **SAE P3XXX-DTCS** .

NOTE:

- **The DTC table is sorted by SAE codes.**
- **"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.**
- **Erase DTC memory after repairing malfunction, see DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Diagnostic mode 8: Tank leak test

Function

This diagnostic mode checks the fuel system for leaks.

NOTE:

- **The Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- and Leak detection pump (LDP) -V144- seal the tank system.**
- **Pressure (max. 70 mbar) can be applied to the fuel system via the test connection (in engine compartment, right) and via engine leak detection spray (e.g.: G 001 800 A1) leaks can be detected.**

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.
- Intake air temperature must not be above the maximum of 60 C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 15, Intake air temperature.

Function test

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .

- Start engine and let run at idle for at least 15 minutes.
- Under address word 33, select "Diagnostic mode 8: Tank leak test".
- Select measuring value "Test -ID 01: Tank leak test".
- Check specified value of tank leak test at idle.

TEST-ID 01: TANK LEAK TEST: SPECIFIED VALUE SPECIFICATION

Test-ID 01: Tank leak test	Specified value:
• Test function is being initiated, please wait • Test function aborted • Test function active • Test function off	Test function active

NOTE:

- **During tank leak test, Engine Control Module (ECM) limits "test function active" to approx. 12 minutes.**
- **If the accelerator pedal is depressed during the test, the test will be aborted.**
- **To repeat the tank leak test, switch ignition off and start engine again and let run at idle for at least 15 minutes.**

If specified value is obtained:

- End diagnosis and switch ignition off.

If specified value is not obtained:

- EVAP canister system, checking for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak detection pump (LDP) -V144-, checking, see **CHECK LEAK DETECTION PUMP (LDP)** .

Diagnostic mode 9: Vehicle information

Function

In this diagnostic mode, vehicle specific diagnostic data such as e.g. the control module versions will be displayed.

Requirement

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Switch ignition on.
- Under address word 33, select "Diagnostic mode 9: vehicle information".
- Select desired vehicle information "Test -ID XX".

Display vehicle information

DISPLAY VEHICLE INFORMATION

Test-ID	Diagnostic text
04:	Calibration identification example: • 06A906032LS 4745Engine Control Module (ECM) identification
06:	CVN (control module -check sum) example: • 7608.0034the check sum is different for every control module version • No results

- End diagnosis and switch ignition off.

READINESS CODE

Function

The readiness code is an 8 digit number block that indicates the status of emission relevant diagnostics.

When the diagnostic for a system (e.g.: secondary air system) has run through successfully, the respective digit of the number block is set from 1 to 0.

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an exhaust relevant system, the readiness code should be generated via a road test to ensure that these systems are working according to specifications. If a malfunction is recognized during diagnostic, it is stored in DTC memory.

The readiness code is erased every time DTC memory is erased or when voltage supply is interrupted. DTC memory should therefore only be erased when there are DTCs stored.

Read readiness code

Requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- select desired measuring value "PID 01".
- Observe the right 8 -digit number block:

If all diagnoses have run through successfully, the 8-digit number block

Specified value: 00000000 must be displayed.

Evaluation PID 01: System status-information (right 8-digit number block:)

EVALUATION PID 01: SYSTEM STATUS-INFORMATION

Meaning if display position = 0								
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Diagnostic function**
0								Exhaust gas recirculation OK • not available/always "0"
	0							Oxygen sensor heater OK
		0						Oxygen sensors OK
			0					A/C system OK • no diagnostic/always "0"
				0				Secondary Air Injection (AIR) system OK
					0			EVAP canister system (tank ventilation system) OK
						0		Catalytic converter heater OK • no diagnostic/always "0"
							0	Catalytic converter OK

If a 1 is displayed instead of a 0 in the 8 -digit number block:

- Generate readiness code, see **READINESS CODE, GENERATING** .

Readiness code, generating

Requirements

- The respective fuses of the Motronic fuel injection and ignition system must be OK. Fuse holder is located behind access panel at far left end of dash.

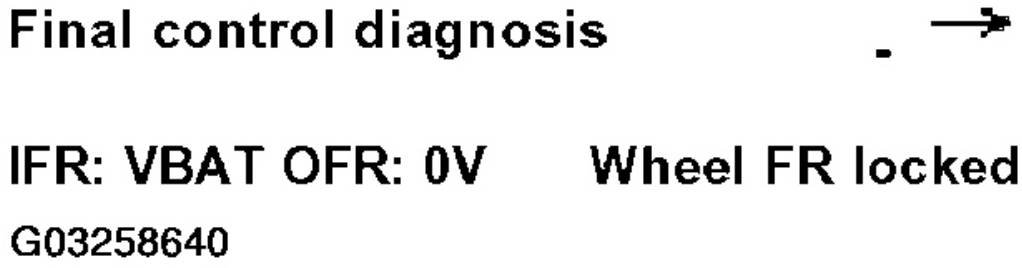


Fig. 12: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Intake air temperature 5 to 35 C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 15: Intake Air Temperature (IAT)

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test.

The following operating condition must be met during this road test:

- Coolant temperature must reach at least 80 C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Observe the safety precautions that apply to road tests, see **SAFETY PRECAUTIONS** .

Let vehicle cool off with the ignition switched off until the following condition is met:

- Coolant temperature approx. intake air temperature (5 to 35 °C), see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.

NOTE:

- **Vehicle speed, see DIAGNOSTIC MODE 1: CHECK MEASURED VALUES ; PID 13, Vehicle speed.**
- **Engine speed, see DIAGNOSTIC MODE 1: CHECK MEASURED VALUES ; PID 12, engine rotations per minute (RPM).**

- After 10 minutes, downshift until an engine speed of 2800 to 3500 RPM has been reached.
- Drive in deceleration mode at a speed up to approx. 1800 RPM.
- Park vehicle and let engine run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let engine run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Read readiness code, see **READ READINESS CODE** .

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Read readiness code, see **READ READINESS CODE** .

In 8-digit number block:

- Display position 5: Secondary Air Injection (AIR) system

  and/or

- Display position 6: EVAP canister system

a 1 instead of 0 is displayed:

- Repeat complete work procedure, see **WORK PROCEDURE**

DIAGNOSTIC TROUBLE CODE (DTC) TABLES:

SAE P0xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P0010 TO P0032

SAE DTC	DTC text	Corrective action
P0010	"A" Camshaft Position Actuator Circuit Bank 1	• Check Valve -1- for camshaft adjustment -N205-, see **VALVE FOR CAMSHAFT ADJUSTMENT, CHECKING (VEHICLES WITH ENGINE CODE AWP, AWV)**
P0011	"A" Camshaft Position - Timing Over - Advanced or System Performance Bank 1	
P0012	"A" Camshaft Position - Timing Over - Retarded Bank 1	
P0016	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	• Check Camshaft Position (CMP) Sensor -G40-or Camshaft Position (CMP) Sensor 2 -G163-, see **CHECK CAMSHAFT POSITION (CMP) SENSOR**
P0030	HO2S Heater Control Circuit Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**
P0031	HO2S Heater Control Circuit Low Bank 1 Sensor 1	
P0032	HO2S Heater Control Circuit High Bank 1 Sensor 1	

DIAGNOSTIC TROUBLE CODE P0036 TO P0038

SAE DTC	DTC text	Corrective action

P0036	HO2S Heater Control Circuit Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER**
P0037	HO2S Heater Control Circuit Low Bank 1 Sensor 2	
P0038	HO2S Heater Control Circuit High Bank 1 Sensor 2	

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0101 TO P0113

SAE DTC	DTC text	Corrective action
P0101	Mass or Volume Air Flow Circuit Range/Performance	• Check Mass Air Flow (MAF) Sensor -G70-, see **MASS AIR FLOW (MAF) SENSOR, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING**
P0102	Mass or Volume Air Flow Circuit Low Input	
P0103	Mass or Volume Air Flow Circuit High Input	
P0112	Intake Air Temperature Sensor 1 Circuit Low	• Check Intake Air Temperature (IAT) Sensor -G42-, see **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR**
P0113	Intake Air Temperature Sensor 1 Circuit High	

[1)] Intake manifold pressure is determined by the Charge Air Pressure Sensor -G31- (instead of Manifold Absolute Pressure (MAP) Sensor -G71- as indicated), air pressure is determined by the Barometric Pressure (BARO) Sensor - F96- (in ECM).

DIAGNOSTIC TROUBLE CODE P0116 TO P0135

SAE DTC	DTC text	Corrective action
P0116	Engine Coolant Temperature Circuit Range/Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check coolant regulator: See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**
P0117	Engine Coolant Temperature Circuit Low	
P0118	Engine Coolant Temperature Circuit High	
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE,**

	Range/Performance	**CHECKING**
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	
P0132	O2 Sensor Circuit High Voltage Bank 1 Sensor 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**
P0133	O2 Sensor Circuit Slow Response Bank 1 Sensor 1	
P0134	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 1	
P0135	O2 Sensor Heater Circuit Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

DIAGNOSTIC TROUBLE CODE P0136 TO P0141

SAE DTC	DTC text	Corrective action
P0136	O2 Sensor Circuit Bank 1 Sensor 2	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER**
P0137	O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	
P0138	O2 Sensor Circuit High Voltage Bank 1 Sensor 2	
P0139	O2 Sensor Circuit Slow Response Bank 1 Sensor 2	
P0140	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	
P0141	O2 Sensor Heater Circuit Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

DIAGNOSTIC TROUBLE CODE P0171

SAE DTC	DTC text	Corrective action
P0171	System Too Lean Bank 1	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** • Check Fuel Pump (FP) -G6-, see **CHECK FUEL PUMP** • Check exhaust system for proper seal, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** • Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P0172

SAE DTC	DTC text	Corrective action
P0172	System Too Rich Bank 1	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0201 TO P0204

SAE DTC	DTC text	Corrective action
P0201	Injector Circuit/Open - Cylinder 1	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING**
P0202	Injector Circuit/Open	

	- Cylinder 2	
P0203	Injector Circuit/Open - Cylinder 3	
P0204	Injector Circuit/Open - Cylinder 4	

DIAGNOSTIC TROUBLE CODE P0221 TO P0238

SAE DTC	DTC text	Corrective action
P0221	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	
P0230	Fuel Pump Primary Circuit	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram.
P0236	Turbo/Super Charger Boost Sensor "A" Circuit Range/Performance	• Check Charge Air Pressure Sensor -G31-, see **CHARGE AIR PRESSURE SENSOR, CHECKING**
P0237	Turbo/Super Charger Boost Sensor "A" Circuit Low	
P0238	Turbo/Super Charger Boost Sensor "A" Circuit High	

DIAGNOSTIC TROUBLE CODE P0261 TO P0271

SAE DTC	DTC text	Corrective action
P0261	Cylinder 1 Injector Circuit Low	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-), see **FUEL INJECTORS, CHECKING**
P0262	Cylinder 1 Injector Circuit High	
P0264	Cylinder 2 Injector Circuit Low	
P0265	Cylinder 2 Injector Circuit High	
P0267	Cylinder 3 Injector Circuit Low	
P0268	Cylinder 3 Injector Circuit High	
P0270	Cylinder 4 Injector Circuit Low	
P0271	Cylinder 4 Injector Circuit High	

DIAGNOSTIC TROUBLE CODE P0300 TO P0304

SAE DTC	DTC text	Corrective action
P0300	Random/Multiple Cylinder Misfire Detected	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check spark plugs, see **TEST DATA, SPARK PLUGS** • Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**
P0301	Cylinder 1 Misfire Detected	
P0302	Cylinder 2 Misfire Detected	
P0303	Cylinder 3 Misfire Detected	
P0304	Cylinder 4 Misfire Detected	

DIAGNOSTIC TROUBLE CODE P0321 TO P0333

SAE DTC	DTC text	Corrective action
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	• Check Engine Speed (RPM) Sensor -G28-, see **CHECK ENGINE SPEED (RPM) SENSOR**
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	
P0324	Knock Control System Error	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-), see **CHECK KNOCK SENSORS** • Loosen knock sensors and tighten to 20 Nm again • Repair abnormal engine noise (components loose, bracket/bolts broken) • Change fuel types
P0327	Knock Sensor 1 Circuit Low Bank 1 or Single Sensor	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-), see **CHECK KNOCK SENSORS** • Loosen knock sensors and tighten to 20 Nm again
P0328	Knock Sensor 1 Circuit High Bank 1 or Single Sensor	
P0332	Knock Sensor 2 Circuit Low Bank 2	
P0333	Knock Sensor 2 Circuit High Bank 2	

DIAGNOSTIC TROUBLE CODE P0341 TO P0354

SAE DTC	DTC text	Corrective action
P0341	Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	• Check Camshaft Position (CMP) Sensor - G40-, see **CHECK CAMSHAFT POSITION (CMP) SENSOR**
P0342	Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	
P0343	Camshaft Position Sensor "A" Circuit	

	High Bank 1 or Single Sensor	
P0351	Ignition Coil "A" Primary/Secondary Circuit	• Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**
P0352	Ignition Coil "B" Primary/Secondary Circuit	
P0353	Ignition Coil "C" Primary/Secondary Circuit	
P0354	Ignition Coil "D" Primary/Secondary Circuit	

Additional exhaust regulation

DIAGNOSTIC TROUBLE CODE P0411 TO P0418

SAE DTC	DTC text	Corrective action
P0411	Secondary Air Injection System Incorrect Flow Detected	• Check Secondary Air Injection (AIR) Pump Motor -V101-, see **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** • Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING** • Check combination valve, see **COMBINATION VALVE, CHECKING** • Checking hoses and connecting pipes to and between components, see **SECONDARY AIR INJECTION (AIR) SYSTEM**
P0412	Secondary Air Injection System Switching Valve "A" Circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	
P0418	Secondary Air Injection System Control "A" Circuit	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.

DIAGNOSTIC TROUBLE CODE P0420 TO P0456

SAE DTC	DTC text	Corrective action
P0420	Catalyst System Efficiency Below Threshold Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN**

		SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER**
P0441	Evaporative Emission System Incorrect Purge Flow	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** • EVAP canister system, check for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL**
P0442	Evaporative Emission System Leak Detected (small leak)	
P0444	Evaporative Emission System Purge Control Valve Circuit Open	
P0445	Evaporative Emission System Purge Control Valve Circuit Shorted	
P0455	Evaporative Emission System Leak Detected (large leak)	
P0456	Evaporative Emission System Leak Detected (very small leak)	

Speed and idle control

DIAGNOSTIC TROUBLE CODE P0501 TO P0507

SAE DTC	DTC text	Corrective action
P0501	Vehicle Speed Sensor "A" Range/Performance	• Check speed signal, see **SPEED SIGNAL, CHECKING**
P0506	Idle Air Control System RPM Lower Than Expected	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P0507	Idle Air Control System RPM Higher Than Expected	

Control module and output signals

DIAGNOSTIC TROUBLE CODE P0600 TO P0638

SAE DTC	DTC text	Corrective action
P0600	Serial Communication Link	• Check terminal resistance for CAN-Bus, see **TERMINAL RESISTANCE FOR CAN-BUS,**

		CHECKING
P0601	Internal Control Module Memory Check Sum Error	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P0602	Control Module Programming Error	
P0604	Internal Control Module Random Access Memory (RAM) Error	
P0605	Internal Control Module Read Only Memory (ROM) Error	
P0606	ECM/PCM Processor	
P0638	Throttle Actuator Control Range/Performance Bank 1	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING** • Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-, see **THROTTLE POSITION (TP) SENSOR, CHECKING**

DIAGNOSTIC TROUBLE CODE P0685 TO P0687

SAE DTC	DTC text	Corrective action
P0685	ECM/PCM Power Relay Control Circuit /Open	• Check voltage supply of Motronic Engine Control Module (ECM) -J220-, see **VOLTAGE SUPPLY FOR ENGINE CONTROL MODULE (ECM), CHECKING** • Check Activation of Motronic Engine Control Module (ECM) Power Supply Relay -J271- according to wiring diagram.
P0686	ECM/PCM Power Relay Control Circuit Low	
P0687	ECM/PCM Power Relay Control Circuit High	

SAE P1xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1102 & P1105

SAE DTC	DTC text	Corrective action
P1102	"O2 Sensor Heating Circ.,Bank1 - Sensor1 Short to B+"	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**
P1105	"O2 Sensor Heating Circ.,Bank1 - Sensor2 Short to B+"	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

DIAGNOSTIC TROUBLE CODE P1115 TO P1127

SAE DTC	DTC text	Corrective action
P1115	"O2 Sensor Heater Circ.,Bank1 - Sensor1 Short to Ground"	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**
P1116	"O2 Sensor Heater Circ.,Bank1 - Sensor1 Open"	
P1117	"O2 Sensor Heater Circ.,Bank1 - Sensor2 Short to Ground"	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**
P1118	"O2 Sensor Heater Circ.,Bank1 - Sensor2 Open"	
P1127	"Long Term Fuel Trim mult.,Bank1 System too Rich"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**

DIAGNOSTIC TROUBLE CODE P1128

SAE DTC	DTC text	Corrective action
P1128	"Long Term Fuel Trim mult.,Bank1 System too Lean"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** • Check Fuel Pump (FP) -G6 -, see **CHECK FUEL PUMP** • Check exhaust system for proper seal, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** • Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1136 & P1137

SAE DTC	DTC text	Corrective action
P1136	"Long Term Fuel Trim Add. Fuel,Bank1 System too Lean"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** • Check Fuel Pump (FP) -G6-, see **CHECK FUEL PUMP** • Check exhaust system for proper seal, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** • Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** • Check vacuum lines for leaks
P1137	"Long Term Fuel Trim Add. Fuel,Bank1 System too Rich"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**

NOTE: add = additive, means that malfunction is only valid at closed throttle (idle).

DIAGNOSTIC TROUBLE CODE P1171 TO P1198

SAE DTC	DTC text	Corrective action
P1171	"Throttle Actuation Potentiometer Sign.2 Range/Performance"	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P1172	"Throttle Actuation Potentiometer Sign.2 Signal too Low"	
P1173	"Throttle Actuation Potentiometer Sign.2 Signal too High"	
P1176	"O2 Correction Behind Catalyst,B1 Limit Attained"	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**

		• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING**
P1198	"O2 Sensor Heater Circ.,Bank1 -Sensor2 Electrical Malfunction"	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1213 TO P1216

SAE DTC	DTC text	Corrective action
P1213	"Cyl.1 -Fuel Inj. Circ. Short to B+"	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-), see **FUEL INJECTORS, CHECKING**
P1214	"Cyl.2 -Fuel Inj. Circ. Short to B+"	
P1215	"Cyl.3 -Fuel Inj. Circ. Short to B+"	
P1216	"Cyl.4 -Fuel Inj. Circ. Short to B+"	

DIAGNOSTIC TROUBLE CODE P1125 TO P1296

SAE DTC	DTC text	Corrective action
P1225	"Cyl.1 -Fuel Inj. Circ. Short to Ground"	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING**
P1226	"Cyl.2 -Fuel Inj. Circ. Short to Ground"	
P1227	"Cyl.3 -Fuel Inj. Circ. Short to Ground"	
P1228	"Cyl.4 -Fuel Inj. Circ. Short to Ground"	
P1237	"Cyl.1 -Fuel Inj. Circ. Open Circ."	
P1238	"Cyl.2 -Fuel Inj. Circ. Open Circ."	
P1239	"Cyl.3 -Fuel Inj. Circ. Open Circ."	
P1240	"Cyl.4 -Fuel Inj. Circ.	

	Open Circ."	
P1296	"Cooling System Malfunction"	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check coolant regulator: See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**

Ignition system

DIAGNOSTIC TROUBLE CODE P1336

SAE DTC	DTC text	Corrective action
P1336	"Engine torque control Adaption at limit"	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check Intake Air Temperature (IAT) Sensor -G42-, see **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR**

DIAGNOSTIC TROUBLE CODE P1340 TO P1366

SAE DTC	DTC text	Corrective action
P1340	"Crankshaft-/Camshaft Pos. Sens. Signals Out of Sequence"	• Check Camshaft Position (CMP) Sensor -G40-or Camshaft Position (CMP) Sensor 2 -G163-, see **CHECK CAMSHAFT POSITION (CMP) SENSOR** • Check Engine Speed (RPM) Sensor -G28-, see **CHECK ENGINE SPEED (RPM) SENSOR**
P1355	"Cyl. 1, ignition circuit open"	• Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**
P1356	"Cyl. 1, ignition circuit short to B+"	
P1357	"Cyl. 1, ignition circuit short to ground"	
P1358	"Cyl. 2, ignition circuit open"	
P1359	"Cyl. 2, ignition circuit short to B+"	
P1360	"Cyl. 2, ignition circuit short to ground"	
P1361	"Cyl. 3, ignition circuit open"	
P1362	"Cyl. 3, ignition circuit short to B+"	

P1363	"Cyl. 3, ignition circuit short to ground"	
P1364	"Cyl. 4 ignition circuit open"	
P1365	"Cyl. 4, ignition circuit short to B+"	
P1366	"Cyl. 4, ignition circuit short to ground"	

DIAGNOSTIC TROUBLE CODE P1387 & P1388

SAE DTC	DTC text	Corrective action
P1387	"Internal Contr. Module altitude sensor error"	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P1388	"Internal Contr. Module drive by wire error"	

Additional exhaust regulation

DIAGNOSTIC TROUBLE CODE P1409 TO P1426

SAE DTC	DTC text	Corrective action
P1409	"Tank Ventilation Valve Circ Electrical Malfunction"	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**
P1410	"Tank Ventilation Valve Circ Short to B+"	
P1420	"Sec. Air Inj. Valve Circ Electrical Malfunction"	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**
P1421	"Sec. Air Inj. Valve Circ Short to Ground"	
P1422	"Sec. Air Inj. Sys. Contr. Valve Circ Short to B+"	
P1424	"Sec. Air Inj. Sys., Bank1 Leak Detected"	• Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL**
P1425	"Tank Vent. Valve Short to Ground"	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**
P1426	"Tank Vent. Valve Open"	

DIAGNOSTIC TROUBLE CODE P1432 TO P1435

SAE DTC	DTC text	Corrective action
P1432	"Sec. Air Inj. Valve Open"	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**
P1433	"Sec. Air Inj. Sys. Pump Relay Circ open"	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.
P1434	"Sec. Air Inj. Sys. Pump Relay Circ Short to B+"	
P1435	"Sec. Air Inj. Sys. Pump Relay Circ Short to ground"	

DIAGNOSTIC TROUBLE CODE P1471 TO P1476

SAE DTC	DTC text	Corrective action
P1471	"EVAP Emission Contr. LDP Circ. Short to B+"	• Check Leak detection pump (LDP) -V144-, see **CHECK LEAK DETECTION PUMP (LDP)** • Check EVAP canister system, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL**
P1472	"EVAP Emission Contr. LDP Circ. Short to Ground"	
P1473	"EVAP Emission Contr. LDP Circ. Open Circ."	
P1475	"EVAP Emission Contr. LDP Circ. Malfunction/Signal Circ.Open"	
P1476	"EVAP Emission Contr. LDP Circ. Malfunction/Insufficient Vacuum"	

Speed and idle control

DIAGNOSTIC TROUBLE CODE P1501 & P1502

SAE DTC	DTC text	Corrective action
P1501	"Fuel Pump Relais Circ. Short to Ground"	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram.
P1502	"Fuel Pump Relais Circ. Short to B+"	

DIAGNOSTIC TROUBLE CODE P1541 TO P1545

SAE DTC	DTC text	Corrective action
P1541	"Fuel Pump Relay Circ. Open"	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram.
P1542	"Throttle Actuation Potentiometer	• Check Throttle Valve Control Module -J338-, see

	Range/Performance"	**THROTTLE VALVE CONTROL MODULE, CHECKING**
P1543	"Throttle Actuation Potentiometer Signal too Low"	
P1544	"Throttle Actuation Potentiometer Signal too High"	
P1545	"Throttle Pos. Contr. Malfunction"	

DIAGNOSTIC TROUBLE CODE P1558 TO P1565

SAE DTC	DTC text	Corrective action
P1558	"Throttle Actuator Electrical Malfunction"	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P1559	"Idle Speed Contr. Throttle Pos. Adaptation Malfunction"	
P1560	"Maximum Engine Speed Exceeded"	• Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** • Repair mechanical damage
P1565	"Idle Speed Control Throttle Position lower limit not attained"	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**

DIAGNOSTIC TROUBLE CODE P1592

SAE DTC	DTC text	Corrective action
P1592	"Barometric/boost pressure signal ratio out of range"	• Check Charge Air Pressure Sensor -G31-, see **CHARGE AIR PRESSURE SENSOR, CHECKING**

Control module and output signals

DIAGNOSTIC TROUBLE CODE P1603 TO P1673

SAE DTC	DTC text	Corrective action
P1603	"Internal Control Module Self Check"	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P1630	"Accelera. Pedal Pos. Sensor 1 Signal too Low"	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-, see **THROTTLE POSITION (TP) SENSOR, CHECKING**
P1631	"Accelera. Pedal Pos. Sensor 1 Signal too High"	
P1633	"Accelera. Pedal Pos. Sensor 2 Signal too Low"	

P1634	"Accelera. Pedal Pos. Sensor 2 Signal too High"	
P1639	"Accelera. Pedal Pos. Sensor 1+2 Range/Performance"	
P1640	"Internal Contr. Module (EEPROM) Error"	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P1648	"Data Bus Powertrain defect"	• Check terminal resistance for CAN-Bus, see **TERMINAL RESISTANCE FOR CAN-BUS, CHECKING**
P1649	"Data Bus Powertrain missing message from break ECU"	• Check DTC memory of ABS control module: See **ON BOARD DIAGNOSTIC (OBD)**
P1673	Speed Signal error message from ABS ECU	

SAE P2xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P2101 TO P2138

SAE DTC	DTC text	Corrective action
P2101	Throttle Actuator Control Motor Circuit Range/Performance	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P2106	Throttle Actuator Control System - Forced Limited Power	
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-, see **THROTTLE POSITION (TP) SENSOR, CHECKING**
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	
P2133	Throttle/Pedal Position Sensor/Switch "F" Circuit High Input	
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	

DIAGNOSTIC TROUBLE CODE P2181 & P2279

SAE DTC	DTC text	Corrective action
P2181	Cooling System Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check coolant regulator: See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**
P2279	Intake Air System Leak	• Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING**

Additional exhaust regulation

DIAGNOSTIC TROUBLE CODE P2400 TO P2404

SAE DTC	DTC text	Corrective action
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	• Check Leak detection pump (LDP) -V144-, see **CHECK LEAK DETECTION PUMP (LDP)** • EVAP canister system, check for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL**
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	

SAE P3xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P3081

SAE DTC	DTC text	Corrective action
P3081	Engine temperature to low	• Let engine warm up • Coolant temperature must be at least 50 C Diagnostic mode 1: Check measuring values; PID 5, Coolant temperature

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P3211

SAE		

DTC	DTC text	Corrective action
P3211	Exhaust-bank1-sensor1, Heater return connection	• Check oxygen sensor heater for oxygen sensors before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**

GENERIC SCAN TOOL

GENERAL INFORMATION FOR ON BOARD DIAGNOSTIC (OBD)

Characteristics of On Board Diagnostic (OBD)

The control module for Diesel-Direct fuel injection system is equipped with a DTC memory.

If malfunctions occur at the emission relevant systems or components, they are stored in DTC memory with a description of the malfunction type.

The control module for Diesel-Direct fuel injection system differentiates between different DTCs after evaluating the information. See **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:** .

The stored malfunctions can be checked with a standard diagnostic tester. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

When harness connectors are disconnected from the control module for Diesel-Direct fuel injection system or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again. See **READINESS CODE, GENERATING** .

The following work steps must be performed in the described sequence after the malfunction(s) have been repaired:

1. - Check DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
2. - Erase DTC memory. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
3. - For completion, generate readiness code. See **READINESS CODE, GENERATING** .

On Board Diagnostic (OBD), technical data

Control module identification

The control module version is displayed by selecting "Diagnostic mode 9: Vehicle information" under address word 33. See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION** .

Equipment of control module for Diesel-Direct fuel injection system

Equipment Of Control Module Identification

Engine Code	ALH model year up to 04.99	ALH Model year from 05.99 and up
System identification	EDC (Electronic Diesel	EDC (Electronic Diesel

	Control)	Control)
Equipment of control module for Diesel-Direct fuel injection system	80	121
Emissions limiting values according to	Tier 1(1)	Tier 1(1)
On Board Diagnostic (OBD)	OBD II	OBD II
DTC memory	Permanent memory(2)	Permanent memory(2)
Memory for adaptation values	Temporary memory(3)	Temporary memory(3)
Intake manifold change-over	No	No
Camshaft adjustment	No	No
Boost pressure regulation	Yes	Yes
Exhaust Gas Recirculation (EGR)	Yes	Yes

(1) Tier 1 = Non-Low Emission Vehicles (emission values max. 0.25 g/mi HC)

(2) Independent of voltage supply.

(3) Values are erased when voltage supply is interrupted.

Selectable diagnostic modes under address word 33 - OBD

NOTE: The conditions required for selecting the desired diagnostic mode are listed in the following table:

Diagnostic Modes Under Address Word 33

Diagnostic mode			**Requirement:**		
Selectable diagnostic modes under address word 33-OBD			• engine off • Ignition switched on	• Engine running at idle	• Vehicle in drive mode
Mode 1:	Check measured values	See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .	Yes	Yes	Yes
Mode 2:	Check operating conditions	See **DIAGNOSTIC MODE 2: CHECK OPERATING CONDITIONS** .	Yes	Yes	Yes
Mode 3:	Check DTC Memory	See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .	Yes(1)	Yes	Yes
Mode 4:	Reset/erase diagnostic data	See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .	Yes	Yes	Yes
Mode 6:	Check test results of components	See **DIAGNOSTIC MODE 6: CHECK TEST**	Yes(2)	Yes(2)	Yes(2)

	that are not continuously monitored	**RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED** .			
Mode 7:	Check test results of components that are continuously monitored	See **DIAGNOSTIC MODE 7: CHECK TEST RESULTS OF COMPONENTS THAT ARE CONTINUOUSLY MONITORED** .	Yes(1)	Yes	Yes
Mode 9:	Vehicle information	See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION** .	Yes	Yes	Yes

(1) Perform only with ignition switched on when engine does not start (operate starter beforehand for at least 6 seconds).

(2) Test-ID 10 and Test-ID 12 can only be performed with engine at standstill and ignition switched on.

Diagnostic Tester, connecting

Recommended special tools and equipment:

- VAS 5052 Vehicle Diagnostic and Information System with

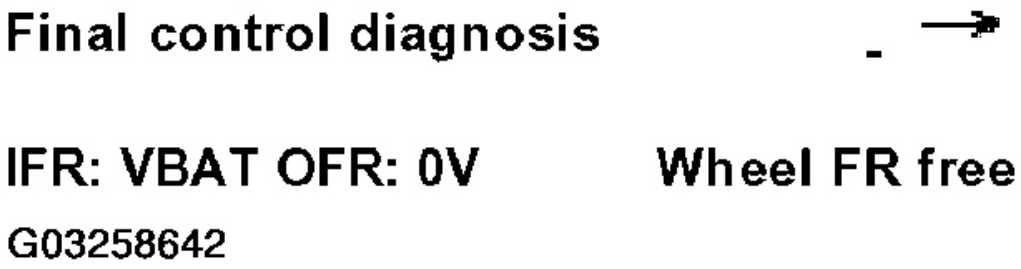


Fig. 1: Identifying Special Tool VAS 5052
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VAS 5052/3 diagnostic cable

Requirements

- The respective fuses of Diesel-Direct fuel injection system must be OK.

NOTE: Fuse holder is located behind access panel at far left end of dash.

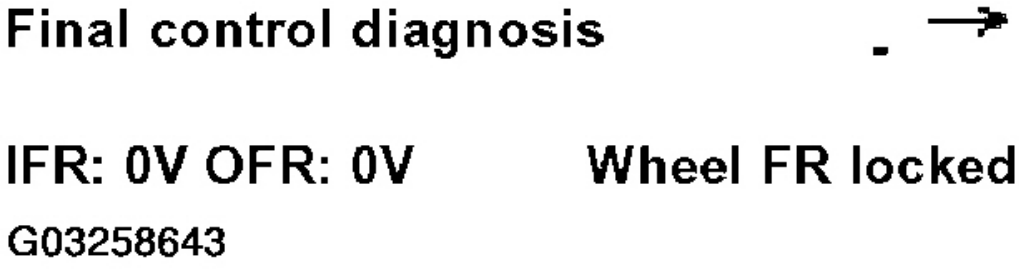


Fig. 2: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 Volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- For vehicles with automatic transmission, selector lever must be in position -P- or -N-.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Ignition switched off.

Work procedure

Connect diagnostic tester (VAS 5052) using (VAS 5052/3) diagnostic cable as follows:

- Connect diagnostic cable connector to Data Link Connector (DLC) -arrow-.

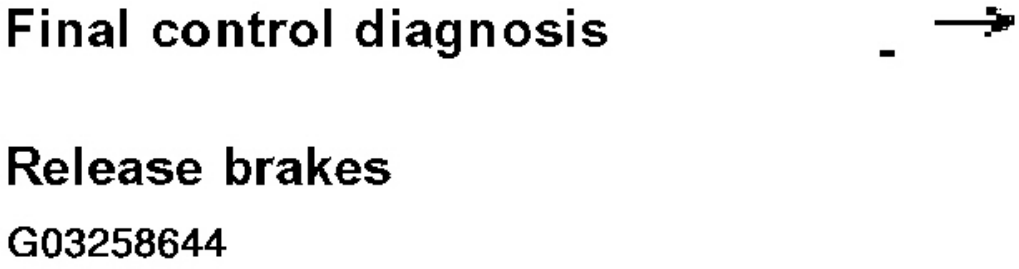


Fig. 3: Locating Data Link Connector
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Depending on the desired diagnostic mode, it is necessary to:switch on ignition or start engine and let it run at idle. See **Selectable diagnostic modes under address word 33 - OBD** .

NOTE:

- **Respective operation of the diagnostic tester:**
- **If no display appears on diagnostic tester, check voltage supply at Diagnostic Link Connector (DLC).**

Test box, connecting for wiring test

Recommended special tools and equipment:

Vehicles with 80-pin control module

- VAG1598/22 test box

Fig. 4: Identifying VAG1598/22 Test Box
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with 121-pin control module

- VAG1598/31 test box

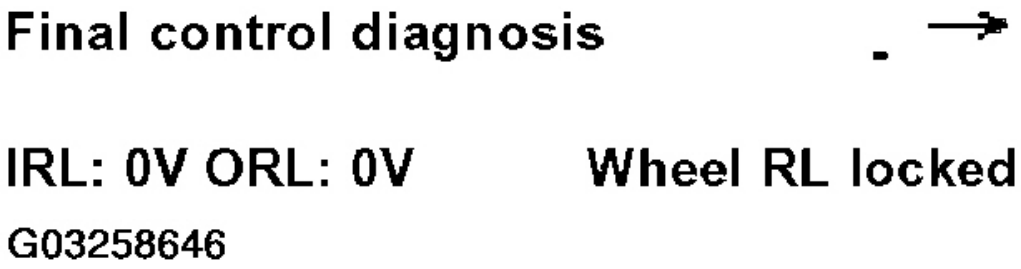


Fig. 5: Identifying VAG1598/31 Test Box
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Requirement

- Ignition switched off.

Work procedure

- Remove inner cover of plenum chamber, left side:
- Then disengage connector from control module and disconnect.

Vehicles with 80-pin control module

- Connect VAG1598/22 test box at control module wiring harness.

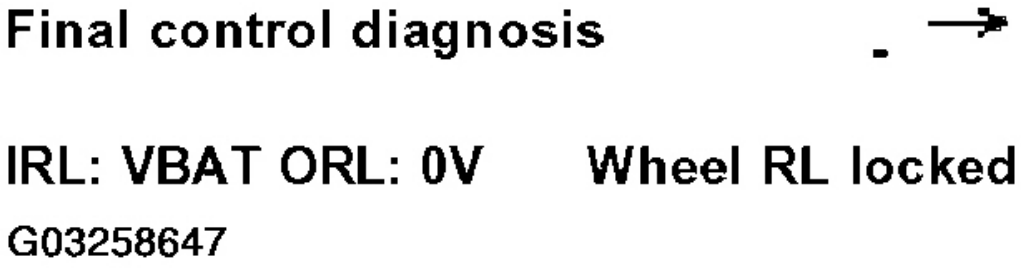


Fig. 6: Connecting VAG1598/22 Test Box At Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with 121-pin control module

- Connect VAG1598/31 test box at control module wiring harness. The control module for Diesel -Direct fuel injection system is not connected during this.

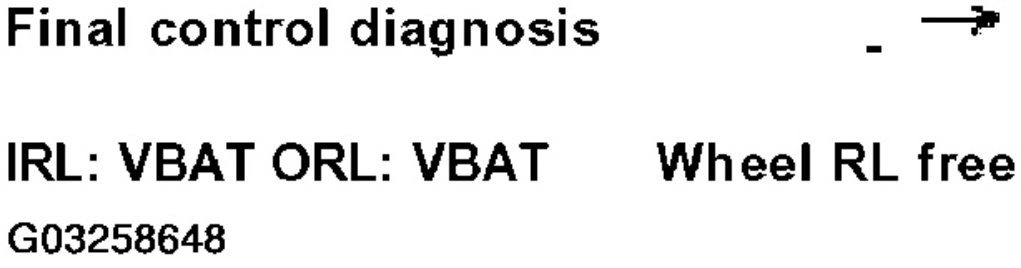


Fig. 7: Connecting VAG1598/31 Test Box At Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

When harness connectors are disconnected from the control module for Diesel-Direct fuel injection system or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again. See **READINESS CODE, GENERATING** .

Malfunction Indicator Lamp (MIL) in instrument cluster

Meaning of exhaust MIL

The Malfunction Indicator Lamp (MIL) lights up when exhaust relevant malfunctions are recognized by the control module for Diesel-Direct fuel injection system.

Component location of exhaust MIL:

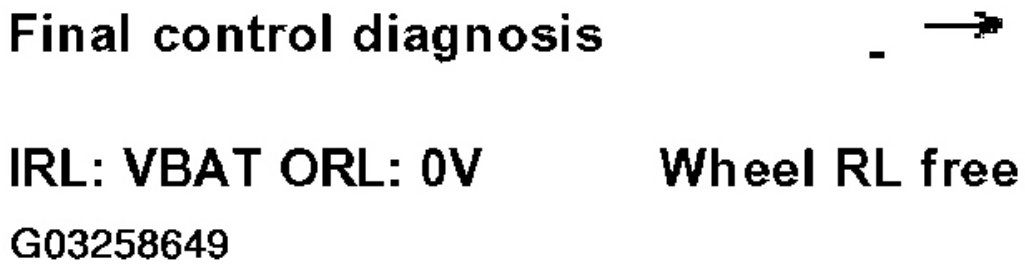


Fig. 8: Identifying Location Of Exhaust Malfunction Indicator Lamp
Courtesy of VOLKSWAGEN OF AMERICA, INC.

1. Exhaust Malfunction Indicator Lamp (MIL)
2. Glow Plug Indicator Light

Glow Plug Indicator Light has a dual function:

- Blinking: Malfunctions were detected which influence drivability.
- Lighting up when ignition is switched on: Normally appears when starting up a cold diesel engine.

NOTE:

- **The exhaust Malfunction Indicator Lamp (MIL) is switched on as soon as malfunctions are detected that increases emissions. DTC memory must be checked in this case. See DIAGNOSTIC MODE 3: CHECK DTC MEMORY .**
- **DTC memory must still be checked if there are drivability problems or customer complaints and the MIL is not lit, since malfunctions can be stored without causing the MIL to light immediately.**

DIAGNOSTIC MODE, SELECTING

Recommended special tools and equipment:

- VAS 5052 Vehicle Diagnostic and Information System with

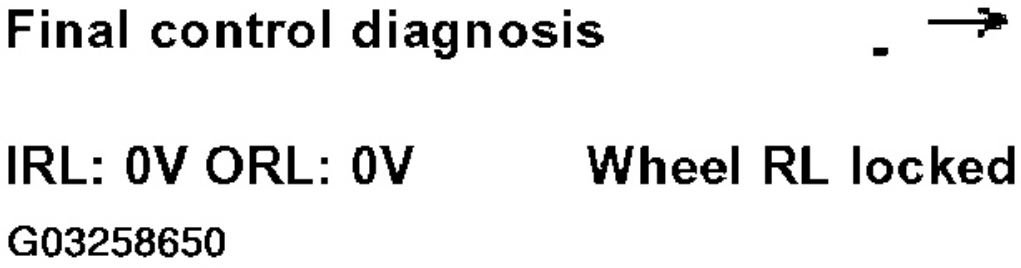


Fig. 9: Identifying Special Tool VAS 5052 Vehicle Diagnostic And Information System
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VAS 5052/3 diagnostic cable

Address word 33 - On-Board Diagnostic (OBD)

Function

Via the diagnostic tester, different diagnostic modes can be selected under "address word 33 - On-Board Diagnostic (OBD)".

The following diagnostic modes monitor all components and systems which influence the emission quality.

Diagnostic mode 1: Check measured values

Requirement

- Coolant temperature must be at least 80 °C, PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .
- Depending on the desired operating condition: switch on ignition

  or start engine and let run at idle.

- Under address word 33, select "Diagnostic mode 1: Check measured values."
- Select the desired measured value(s) "PID XX".

NOTE:

- **The specified values for the respective measuring values can be found at the respective component and function tests.**

- **The following list only serves as an overview.**
- **The measured values are sorted according to the PID (parameter-identifications).**

Diagnostic Mode 1 - PID Measured Values

PID	Display measuring values
01:	Monitoring status since erasing DTC memory
04:	Calculated load condition value
05:	Coolant temperature
11:	Intake manifold pressure
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Valve timing adjustment at 1. cyl. to "advance"
15:	Intake Air Temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)
28:	OBD requirement for which this vehicle is designed
33:	Distance driven with MIL on (km)

- End diagnosis and switch ignition off.

Diagnostic mode 2: Check operating conditions

Function

This diagnostic mode displays the operating conditions at which an emission relevant malfunction was detected and stored by the control module for Diesel-Direct fuel injection system.

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .
- Depending on the desired operating condition: switch on ignition

  or start engine and let run at idle.

- Under address word 33, select "Diagnostic mode 2: Check operating conditions."
- Select the desired operating condition(s) "PID XX".

NOTE: The operating conditions are sorted according to the PID (parameter-identifications).

Diagnostic Mode 2 - PID Operating Conditions

PID	Display operating conditions

02:	DTC which triggered the current reception of all control module information
04:	Calculated load condition value
05:	Coolant temperature
11:	Intake manifold pressure
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Valve timing adjustment at 1. cyl. to "advance"
15:	Intake Air Temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)

If DTCs are displayed in "PID 02":

- Repair stored malfunctions according to DTC table:
- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .
- End diagnosis and switch ignition off.

Diagnostic mode 3: Check DTC Memory

Function

This diagnostic mode indicates all stored DTCs of components and systems which are emission relevant.

Malfunction Indicator Lamp (MIL) in instrument cluster lights up for one DTC entry. See **MALFUNCTION INDICATOR LAMP (MIL) IN INSTRUMENT CLUSTER** .

SAE Diagnostic Trouble Codes (DTCs)

The DTC always consists of a 5-digit alpha-numeric value with the following meaning:

Component group:

- P0xxxx = DTC for drivetrain.

Norm-Code:

- P0xxx = DTCs defined by SAE with specified malfunction texts.

System group:

- Px0xx = Fuel and air ratio and additional emission regulations
- Px1xx = Fuel and air ratio.
- Px2xx = Fuel and air ratio.

- Px3xx = Ignition system.
- Px4xx = additional emission regulation.
- Px5xx = Speed and idle control.
- Px6xx = Control module and output signals.
- Px7xx = Transmission.
- Px8xx = Transmission.
- Px9xx = Control modules, input and output signals.

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- **Operate starter for approx. 6 seconds. Do not switch ignition off afterward.**

- Under address word 33, select "Diagnostic mode 3: Check DTC memory."

The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.
- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .

- Erase DTC memory. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

NOTE:

- **The DTC table is sorted by SAE codes.**
- **"Emission"-relevant malfunctions are additionally indicated in the instrument cluster via the Malfunction Indicator Lamp (MIL). See MALFUNCTION INDICATOR LAMP (MIL) IN INSTRUMENT CLUSTER .**
- **In Diagnostic mode 2, it can be determined at which operating condition a malfunction was detected and stored by the control module for Diesel-Direct fuel injection system. See DIAGNOSTIC MODE 2: CHECK OPERATING CONDITIONS .**
- **Erase DTC memory after repairing malfunction DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Display example:

P0183 Fuel Temperature Sensor A Circuit High

Explanation:

- P0183 = SAE diagnostic trouble code (malfunction identification number).
- Fuel Temperature Sensor A = faulty circuit or malfunctioning component.
- Circuit High = malfunction type as text

Diagnostic mode 4: Reset/erase diagnostic data

Function

This diagnostic mode performs the following functions:

- all emission relevant malfunctions in DTC memory will be erased,
- the operating conditions at which a malfunction was stored will be reset. See **DIAGNOSTIC MODE 2: CHECK OPERATING CONDITIONS** .
- all adaptation values are being reset,
- all test results of the diagnostic functions are being reset.

Requirement

- DTC memory was checked. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 4: Reset/erase diagnostic data."

Erased or reset:

- Number and content of the DTC memories,
- Operating conditions,
- Adaptation values,
- Test results.

- End diagnosis and switch ignition off.
- Generate readiness code. See **READINESS CODE, GENERATING** .

Diagnostic mode 6: Check test results of components that are not continuously monitored

Function

This diagnostic mode displays the test results of emission relevant components and systems which are not continuously monitored.

The values of the individual test results must reach the specified value or must be within the min.- and max.-limits.

Diagnostic Mode 6 Tests

Test-ID	Component, System	Test
09:	Coolant temperature plausibility	See **TEST-ID 09: COOLANT TEMPERATURE PLAUSIBILITY** .
10:	Start-Stop positions test of quantity adjuster	See **TEST-ID 10: START-STOP POSITIONS TEST OF QUANTITY ADJUSTER** .
11:	Fuel temperature plausibility	See **Test-ID 11: Fuel temperature plausibility** .
12:	Plausibility test of Manifold Absolute Pressure (MAP)/Barometric Pressure	See **TEST-ID 12: PLAUSIBILITY TEST OF MANIFOLD ABSOLUTE PRESSURE (MAP)/BAROMETRIC PRESSURE** .

Test-ID 09: Coolant temperature plausibility

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must not be above the maximum of 20 °C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 09: Coolant temperature plausibility".
- Increase engine speed to approx. 1800 RPM.
- Check specified values.

Evaluation test-ID 09 Coolant temperature plausibility

EVALUATION TEST-ID 09

Test-ID 09	Specified value: min.	max.
• Timeframe of diagnostic cycle	-	117 or 46(1)
• Temperature change during diagnostic cycle	8	-
Temperature at end of diagnostic cycle	57	-
(1) Independent of coolant temperature.		

- End diagnosis and switch ignition off.

If specified values are not obtained:

- Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** .
- Erase DTC memory of control module for Diesel - Direct fuel injection system. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 10: Start-Stop positions test of quantity adjuster

Test requirements

- There must not be any DTCs stored in DTC memory **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Fuel temperature must be at least 10 °C.
- Battery voltage must be at least 11.5 Volts.

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Switch ignition on.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 10: Start-Stop positions test of quantity adjuster".
- Check the specified values with ignition switched on.

Evaluation test-ID 10 Start-Stop positions test of quantity adjuster

EVALUATION TEST-ID 10

Test-ID 10	Specified value:	
	min.	max.
• Return message of quantity adjuster in MAX-position	-	242
• Return message of quantity adjuster in MAX-position	212	-
• Return message of quantity adjuster in MIN-position	-	49
• Return message of quantity adjuster in MIN-position	25	-

- End diagnosis and switch ignition off.

If specified values are not obtained:

- Check Modulating Piston Displacement Sensor -G149- and Quantity Adjuster -N146-. See

MODULATING PISTON DISPLACEMENT SENSOR AND QUANTITY ADJUSTER, CHECKING .

- Erase DTC memory of control module for Diesel-Direct fuel injection system. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 11: Fuel temperature plausibility

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 11: Fuel temperature plausibility".
- Check specified values at idle.

Evaluation test-ID 11 Fuel temperature plausibility

EVALUATION TEST-ID 11

Test-ID 11	Specified value:	
	min.	max.
• Timeframe of diagnostic cycle	-	120
• Temperature change in current driving cycle	100	-
• Temperature integral at end of diagnostic cycle	300	-

- End diagnosis and switch ignition off.

If specified values are not obtained:

- Check Fuel Temperature Sensor -G81-. See **FUEL TEMPERATURE SENSOR, CHECKING** .
- Erase DTC memory of control module for Diesel - Direct fuel injection system. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 12: Plausibility test of Manifold Absolute Pressure (MAP)/Barometric Pressure

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Switch ignition on.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 12: Plausibility test of Manifold Absolute Pressure (MAP)/Barometric Pressure".
- Check the specified values with ignition switched on.

Evaluation test-ID 12 Plausibility test of Manifold Absolute Pressure (MAP)/Barometric Pressure

EVALUATION TEST-ID 12

Test-ID 12	Specified value: min.	Specified value: max.
• Absolute difference of Manifold Absolute Pressure (MAP) to Barometric Pressure	-	150

- End diagnosis and switch ignition off.

  If specified values are not obtained:

- Check Manifold Absolute Pressure (MAP) Sensor -G71- and Barometric Pressure (BARO) Sensor -F96-. See **MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR AND BAROMETRIC PRESSURE (BARO) SENSOR, CHECKING** .
- Erase DTC memory of control module for Diesel - Direct fuel injection system. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Diagnostic mode 7: Check test results of components that are continuously monitored

Function

This diagnostic mode indicates all stored DTCs of components and systems which are continuously monitored.

Requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- **Operate starter for approx. 6 seconds. Do not switch ignition off afterward.**

- Under address word 33, select "Diagnostic mode 7: Check test results of components that are continuously monitored".

  The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.

- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .

NOTE:

- **The DTC table is sorted by SAE codes.**
- **Erase DTC memory after repairing malfunction. See DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Diagnostic mode 9: Vehicle information

Function

In this diagnostic mode, vehicle specific diagnostic data such as e.g. the control module versions will be displayed.

Requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .
- Switch ignition on.
- Under address word 33, select "Diagnostic mode 9: vehicle information".
- Select desired vehicle information "Test-ID XX".

Display vehicle information

DISPLAY VEHICLE INFORMATION

Test-ID	Diagnostic text
02:	Vehicle Identification Number (VIN)(1) example: • WVWSP61J22W000225
04:	Calibration identification example: • 022906032CR 0005 Identification of control module for Diesel-Direct fuel injection system
06	CVN (control module-check sum) example: • 76E80034 the check sum is different for every control module version • No results
(1) Display occurs only for vehicles as of model year 2002.	

- End diagnosis and switch ignition off.

READINESS CODE

Function

The readiness code is an 8 digit number block that indicates the status of emission relevant diagnostics.

If a diagnostic for a system has run through successfully, the respective digit of the number block is set from 1 to 0.

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an exhaust relevant system, the readiness code should be generated via a road test to ensure that these systems are working according to specifications. If a malfunction is recognized during diagnostic, it is stored in DTC memory.

The readiness code is erased every time DTC memory is erased or when voltage supply is interrupted. DTC memory should therefore only be erased when there are DTCs stored.

Read readiness code

Requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80 °C **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .

- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 1: Check measured values."
- select desired measuring value "PID 01".
- Observe the right 8-digit number block:

If all diagnoses have run through successfully, the 8-digit number block

Specified value: 00000000 must be displayed.

Evaluation PID 01: System status-information (right 8-digit number block:)

EVALUATION PID 01: SYSTEM STATUS-INFORMATION

Meaning if display position = 0								
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Diagnostic function**
0								Exhaust gas recirculation OK
	0							Oxygen sensor heater OK • not available/always "0"
		0						Oxygen sensors OK • not available/always "0"
			0					A/C system OK • not available/always "0"
				0				Secondary Air Injection (AIR) system OK • not available/always "0"
					0			EVAP canister system (tank ventilation system) OK • not available/always "0"
						0		Catalytic converter heater OK • not available/always "0"
							0	Catalytic converter OK • not available/always "0"

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Generate readiness code. See **READINESS CODE, GENERATING** .

Readiness code, generating

Requirements

- The respective fuses of Diesel-Direct fuel injection system must be OK.

NOTE: Fuse holder is located behind access panel at far left end of dash.

Fig. 10: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 Volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **DIAGNOSTIC TESTER, CONNECTING** .
- Switch ignition on.
- Wait 5 seconds.
- Let engine run at idle.
- Wait 45 seconds.
- Perform a road test.

The following operating conditions must be met during this road test:

- With accelerator pedal depressed completely, accelerate vehicle in 3. gear or in driving mode "3" from 50 km/h to 120 km/h.
- Drive for 2 minutes in 4. gear or in driving mode "D" on a level driving surface at a constant vehicle speed with an engine speed of 1700 to 1900 RPM.

Observe the safety precautions that apply to road tests. See **SAFETY PRECAUTIONS** .

NOTE:

- **Vehicle speed. See DIAGNOSTIC MODE 1: CHECK MEASURED VALUES ; PID 13, Vehicle speed.**
- **Engine speed. See DIAGNOSTIC MODE 1: CHECK MEASURED VALUES ; PID 12, engine rotations per minute (RPM).**

- Park vehicle and switch off ignition.
- Wait 15 seconds.
- Switch ignition on.
- Wait 5 seconds.
- Let engine run at idle.
- Wait 45 seconds.
- Perform a road test anew.

The following operating conditions must be met during this road test:

- With accelerator pedal depressed completely, accelerate vehicle in 3. gear or in driving mode "3" from 50 km/h to 120 km/h.
- Drive for 2 minutes in 4. gear or in driving mode "D" on a level driving surface at a constant vehicle speed with an engine speed of 1700 to 1900 RPM.

  Observe the safety precautions that apply to road tests. See **SAFETY PRECAUTIONS** .

- Park vehicle and let engine run at idle for 3 minutes.
- Accelerator pedal must not be operated during this time.
- Read readiness code. See **READ READINESS CODE** .

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Repeat complete work procedure. See **WORK PROCEDURE** .

DIAGNOSTIC TROUBLE CODE (DTC) TABLES:

SAE P0xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODES P0100-P0108

SAE-DTC	DTC text	Corrective action

P0100	Mass or Volume Air Flow Circuit	• Check Mass Air Flow (MAF) Sensor -G70-. See **MASS AIR FLOW (MAF) SENSOR, CHECKING** .
P0101	Mass or Volume Air Flow Circuit Range/Performance	
P0102	Mass or Volume Air Flow Circuit Low Input	
P0103	Mass or Volume Air Flow Circuit High Input	
P0105	Manifold Absolute Pressure/Barometric Pressure Circuit	• Check Manifold Absolute Pressure (MAP) Sensor -G71- and Barometric Pressure (BARO) Sensor -F96-. See **MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR AND BAROMETRIC PRESSURE (BARO) SENSOR, CHECKING** .
P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	

DIAGNOSTIC TROUBLE CODES P0116-P0128

SAE-DTC	DTC text	Corrective action
P0116	Engine Coolant Temperature Circuit Range/Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check coolant regulator: See **COOLING SYSTEM COMPONENTS, ENGINE SIDE** .
P0117	Engine Coolant Temperature Circuit Low	
P0118	Engine Coolant Temperature Circuit High	
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	• Check coolant regulator: See **COOLING SYSTEM COMPONENTS, ENGINE SIDE** .

DIAGNOSTIC TROUBLE CODES P0181-P0183

SAE-DTC	DTC text	Corrective action
P0181	Fuel Temperature Sensor A Circuit Range/Performance	• Check Fuel Temperature Sensor -G81-. See **FUEL TEMPERATURE SENSOR, CHECKING** .
P0182	Fuel Temperature Sensor A Circuit Low	

P0183	Fuel Temperature Sensor A Circuit High	

Fuel and air ratios

Diagnostic Trouble Code P0216-P0246

SAE-DTC	DTC text	Corrective action
P0216	Injector/Injection Timing Control Circuit	• Check Cold Start Injector -N108-. See **COLD START INJECTOR, CHECKING** .
P0225	Throttle/Pedal Position Sensor/Switch "C" Circuit	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P0226	Throttle/Pedal Position Sensor/Switch "C" Circuit Range/Performance	
P0228	Throttle/Pedal Position Sensor/Switch "C" Circuit High	
P0234	Turbo/Super Charger Overboost Condition	• Check Wastegate Bypass Regulator Valve -N75-. See **WASTEGATE BYPASS REGULATOR VALVE, CHECKING** .
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	

Diagnostic Trouble Code P0251-P0299

SAE-DTC	DTC text	Corrective action
P0251	Injection Pump Fuel Metering Control "A" (Cam/Rotor/Injector)	• Check Modulating Piston Displacement Sensor -G149- and Quantity Adjuster -N146-. See **MODULATING PISTON DISPLACEMENT SENSOR AND QUANTITY ADJUSTER, CHECKING** .
P0252	Injection Pump Fuel Metering Control "A" Range/Performance (Cam/Rotor/Injector)	• Check Cold Start Injector -N108-. See **COLD START INJECTOR, CHECKING** . • Check Needle Lift Sensor -G80-. See **NEEDLE LIFT SENSOR, CHECKING** .
P0299	Turbo/Super Charger Underboost	• Check Wastegate Bypass Regulator Valve -N75-. See **WASTEGATE BYPASS REGULATOR VALVE, CHECKING** .

Ignition system

DIAGNOSTIC TROUBLE CODES P0300-P0322

SAE-DTC	DTC text	Corrective action
P0300	Random/Multiple Cylinder Misfire Detected	• Check compression pressure See **COMPRESSION PRESSURE, CHECKING** . • Check fuel injectors. See **NEEDLE LIFT SENSOR, CHECKING** .
P0301	Cylinder 1 Misfire Detected	
P0302	Cylinder 2 Misfire Detected	
P0303	Cylinder 3 Misfire Detected	
P0304	Cylinder 4 Misfire Detected	
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	• Check Engine Speed (RPM) Sensor -G28-. See **CHECK ENGINE SPEED (RPM) SENSOR** .
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	

Additional exhaust regulation

DIAGNOSTIC TROUBLE CODES P0401-P0403

SAE-DTC	DTC text	Corrective action
P0401	Exhaust Gas Recirculation Flow Insufficient Detected	• Checking EGR Vacuum Regulator Solenoid Valve. See **EGR VACUUM REGULATOR SOLENOID VALVE, CHECKING** . • Check EGR Vacuum Regulator Solenoid Valve -N18-. See **CHECKING EGR VACUUM REGULATOR SOLENOID VALVE** .
P0402	Exhaust Gas Recirculation Flow Excessive Detected	
P0403	Exhaust Gas Recirculation Control Circuit	

Control module and output signals

DIAGNOSTIC TROUBLE CODES P0600-P0670

SAE-DTC	DTC text	Corrective action
P0600	Serial Communication Link	• Check terminal resistance for CAN-Bus. See **TERMINAL RESISTANCE FOR CAN-BUS, CHECKING** .
P0601	Internal Control Module Memory Check Sum Error	• Replace Diesel Direct Fuel Injection (DFI) Engine Control Module (ECM) -J248-. See **CONTROL MODULE FOR DIESEL-DIRECT FUEL INJECTION SYSTEM, REPLACING** .
P0605	Internal Control Module Read Only Memory (ROM) Error	
P0606	ECM/PCM Processor	
P0670	Glow Plug Module Control Circuit	• Check Control module for glow plug triggering -J370-

DIAGNOSTIC TROUBLE CODES P0671-P0674

SAE-DTC	DTC text	Corrective action
P0671	Cylinder 1 Glow Plug Circuit	• Check glow plug system. See **GLOW PLUG SYSTEM, CHECKING** . • Check glow plugs. See **GLOW PLUGS, CHECKING** .
P0672	Cylinder 2 Glow Plug Circuit	
P0673	Cylinder 3 Glow Plug Circuit	
P0674	Cylinder 4 Glow Plug Circuit	
P0670	Glow Plug Module Control Circuit	• Check Control module for glow plug triggering -J370-

GENERIC SCAN TOOL

ON BOARD DIAGNOSTIC (OBD), GENERAL INFORMATION

Characteristics of On Board Diagnostic (OBD)

The Engine Control Module (Motronic Engine Control Module -J220-) is equipped with DTC memory.

If malfunctions occur at the emissions relevant systems or components, they are stored in DTC memory with a description of the malfunction type.

The Engine Control Module (ECM) differentiates between different DTCs after evaluating the information. See **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:** .

The stored malfunctions can be checked with a standard diagnostic tester. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again. See **READINESS CODE, GENERATING** .

The following work steps must be performed in the described sequence after the malfunction(s) have been repaired:

1. - Check DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
2. - Erase DTC memory. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
3. - For completion, generate readiness code. See **READINESS CODE, GENERATING** .

On Board Diagnostic (OBD), technical data

Control module identification

The control module version is displayed by selecting "Diagnostic mode 9: Vehicle information" under address word 33. See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION** .

Engine Control Module (ECM) equipment

ON BOARD DIAGNOSTIC TECHNICAL DATA

Engine Code	AEG	AVH	AZG	BDC
System identification	Motronic M5.9.2	Motronic ME7.5	Motronic ME7.5	Motronic ME7.5

Terminals at Engine Control Module (ECM)	80	121	121	121
Emissions limiting values according to	LEV(1)	ULEV (2)	LEV(1)	ULEV(2)
On Board Diagnostic (OBD)	OBD II	OBD II	OBD II	OBD II
DTC memory(3)	Permanent	Permanent	Permanent	Permanent
Memory for adaptation values (4)	Temporary	Temporary	Temporary	Temporary
Oxygen sensor control	2 sensors	2 sensors	2 sensors	2 sensors
Knock sensor control	2 knock sensors	2 knock sensors	2 knock sensors	2 knock sensors
Intake manifold change-over	No	No	No	Yes
Camshaft adjustment	No	No	No	No
Boost pressure regulation	No	No	No	No
Secondary Air Injection (AIR) system	Yes	Yes	Yes	Yes
Electronic engine load regulation system	No	Yes	Yes	Yes

(1) 1) LEV = Low Emission Vehicles (emission values max. 0.075 g/mi HC).

(2) 2) ULEV = Ultra Low Emission Vehicles (emission values max. 0.040 g/mi HC).

(3) 3) Independent of voltage supply.

(4) 4) Values are erased when voltage supply is interrupted.

Selectable diagnostic modes under address word 33 - OBD

NOTE: The conditions required for selecting the desired diagnostic mode are listed in the following table:

SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD

Diagnostic mode			**Requirement:**		
Selectable diagnostic modes under address word 33 - OBD			• engine off • Ignition switched on.	• Engine running at idle	• Vehicle in drive mode
Mode 1:	Check measured values	See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES**	Yes	Yes	Yes
Mode 2:	Checking operating	See **DIAGNOSTIC MODE 2: CHECKING**	Yes	Yes	Yes

	conditions	**OPERATING CONDITIONS**			
Mode 3:	Check DTC Memory	See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY**	Yes(1)	Yes	Yes
Mode 4:	Reset/erase diagnostic data	See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA**	Yes	Yes	Yes
Mode 5:	Check output of oxygen sensor signals	See **DIAGNOSTIC MODE 5: CHECK OUTPUT OF OXYGEN SENSOR SIGNALS**	Yes	Yes	Yes
Mode 6:	Check test results of components that are not continuously monitored	See **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**	No	Yes	Yes
Mode 7:	Check test results of components that are continuously monitored	See **DIAGNOSTIC MODE 7: CHECK TEST RESULTS OF COMPONENTS THAT ARE CONTINUOUSLY MONITORED**	Yes(1)	Yes	Yes
Mode 8:	Tank leak test	See **DIAGNOSTIC MODE 8: TANK LEAK TEST**	No	Yes	No
Mode 9:	Vehicle information	See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION**	Yes	Yes	Yes
(1) Perform only with ignition switched on when engine does not start (operate starter beforehand for at least 6 seconds).					

Connect diagnostic tester

Recommended special tools and equipment

- VAS 5052 Vehicle Diagnostic and Information System with

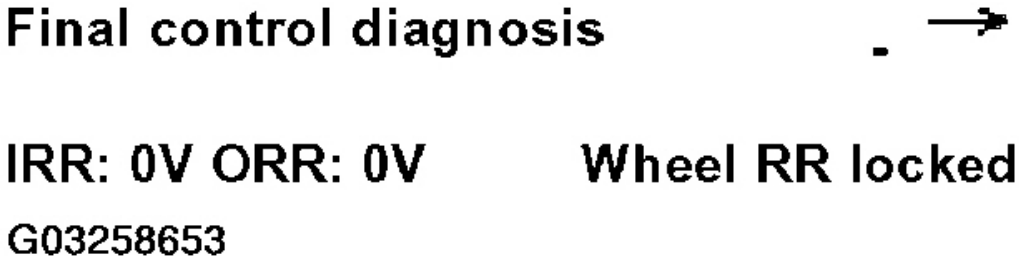


Fig. 1: Identifying VAS 5052 Vehicle Diagnostic And Information System (Connect Diagnostic Tester)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VAS 5052/3 diagnostic cable

Requirements

- The respective fuses of the Motronic fuel injection and ignition system must be OK.

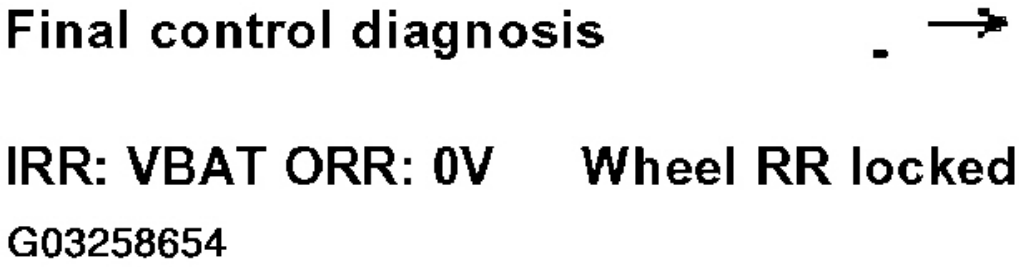


Fig. 2: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Fuse holder is located behind access panel at far left end of dash.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.

- For vehicles with automatic transmission, selector lever must be in position -P- or -N-.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Ignition switched off.

Work procedure

Connect diagnostic tester (VAS 5052) using (VAS 5052/3) diagnostic cable as follows:

- Connect diagnostic cable connector to Data Link Connector (DLC) -arrow-.

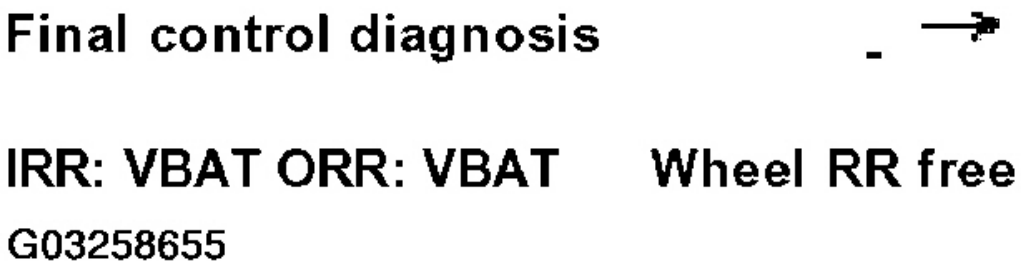


Fig. 3: Locating Data Link Connector
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Depending on the desired diagnostic mode, it is necessary to either switch on ignition or start engine. See **Selectable diagnostic modes under address word 33 - OBD** .

NOTE:

- **Respective operation of the diagnostic tester:**

- If no display appears on diagnostic tester, check voltage supply.

Test box for wiring test, connecting

Recommended special tools and equipment e.g.:

Vehicles with 80-pin Engine Control Module (ECM, engine code AEG)

- VAG1598/22 test box

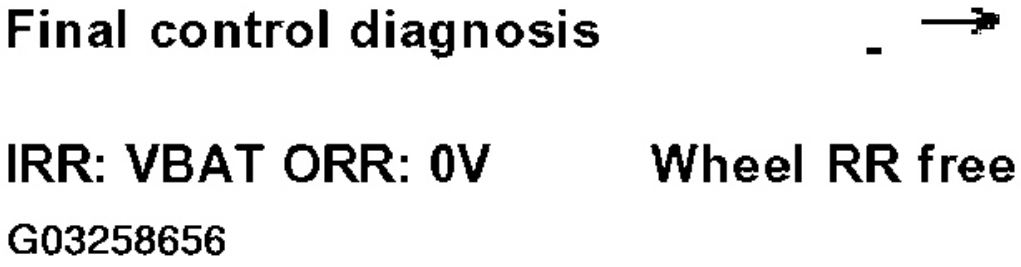


Fig. 4: Identifying VAG1598/22 Test Box (80-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with 121-pin Engine Control Module (ECM, engine code AVH, AZG, BDC)

- VAG1598/31 test box

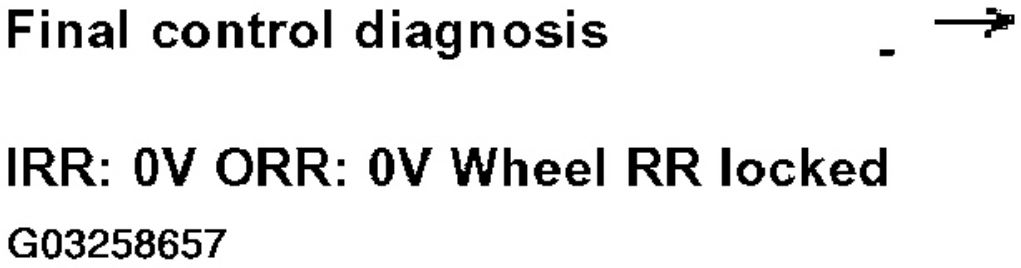


Fig. 5: Identifying VAG1598/31 Test Box (121-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Requirement

- Ignition switched off.

Work procedure

- Remove inner cover, left plenum chamber, to do this, slide center cover -1- of plenum chamber forward out of catch and remove from instrument panel.

Fig. 6: Removing Inner Cover, Left Plenum Chamber By Sliding Center Cover Of Plenum Chamber Forward
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove three bolts -1-.

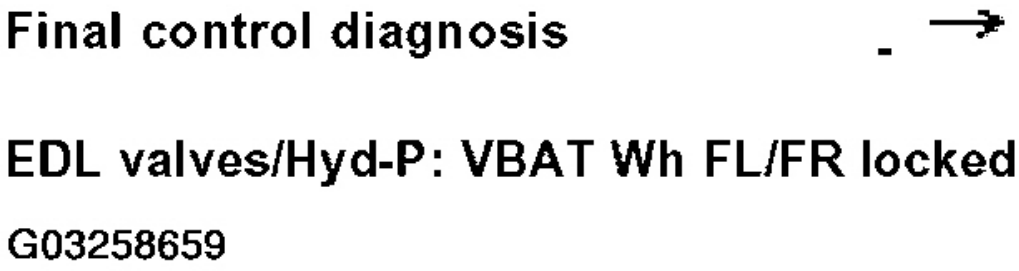


Fig. 7: Removing Three Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lift left cover -1- of plenum chamber in center of instrument panel (arrow A) and thereby unclip (front edge clips, back edge clamps).

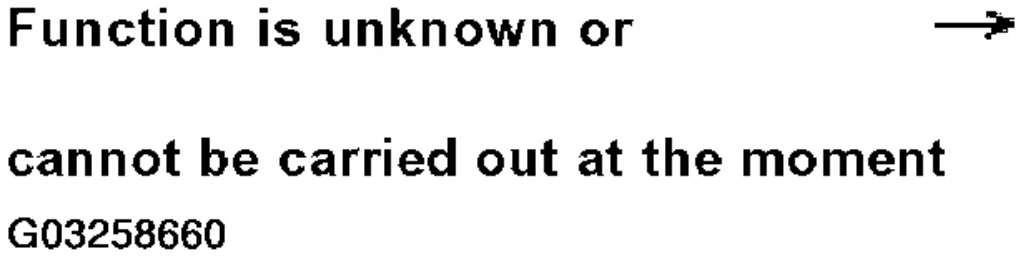


Fig. 8: Lifting Left Cover Of Plenum Chamber In Center Of Instrument Panel And Unclip
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull cover -1- toward vehicle center out of bracket underneath A-pillar (arrow B).
- Then disengage connector from control module and disconnect.

Vehicles with 80-pin Engine Control Module (ECM, engine code AEG)

- Connect VAG1598/22 test box at control module wiring harness.

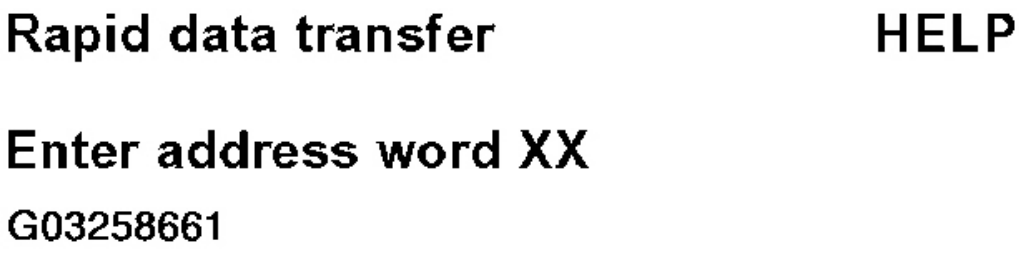


Fig. 9: Connecting VAG1598/22 Test Box At Control Module Wiring Harness (80-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with 121-pin Engine Control Module (ECM, engine code AVH, AZG, BDC)

- Connect VAG1598/31 test box at control module wiring harness. Engine Control Module (ECM) is not connected.

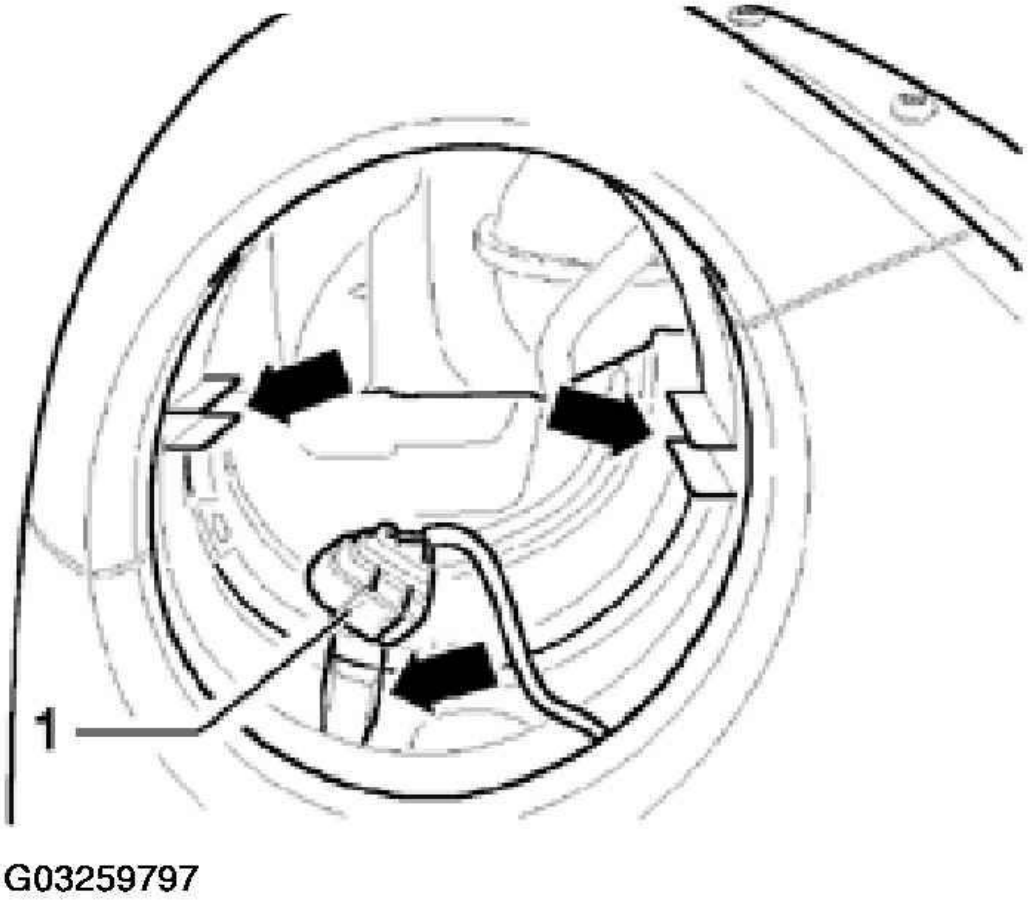


Fig. 10: Connecting VAG1598/31 Test Box At Control Module Wiring Harness (121-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again. See **READINESS CODE, GENERATING** .

Malfunction Indicator Lamp (MIL) in instrument cluster, checking

Meaning of emissions MIL

The Malfunction Indicator Lamp (MIL) lights up when emissions relevant malfunctions are recognized by the Engine Control Module (ECM).

Component location of emissions MIL

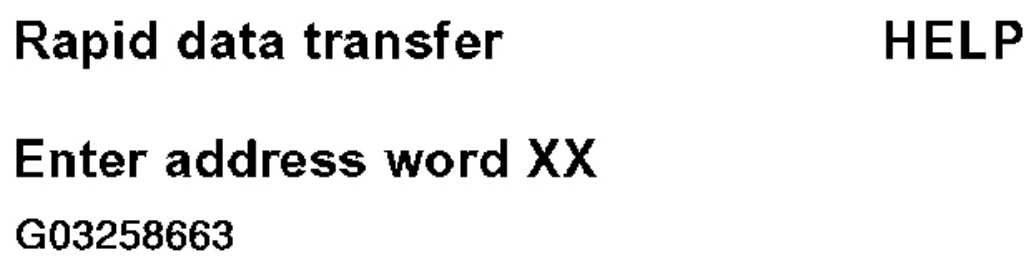


Fig. 11: Identifying Component Location Of Emissions MIL
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The Malfunction Indicator Lamp (MIL) can blink or remain lit continuously. DTC memory must be checked in each case. See DIAGNOSTIC MODE 3: CHECK DTC MEMORY .

- Blinking: There is a malfunction that causes damage to the catalytic converter in this driving condition. In this case, vehicle must only be driven at reduced performance!
- Continuously lit: There is a malfunction that causes increased emissions. Check DTC memory for Motronic control module.
- DTC memory must still be checked if there are driveability problems or customer complaints and the MIL is not lit, since malfunctions can be stored without causing the MIL to light immediately.

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirement

- The respective fuses of instrument cluster must be OK.

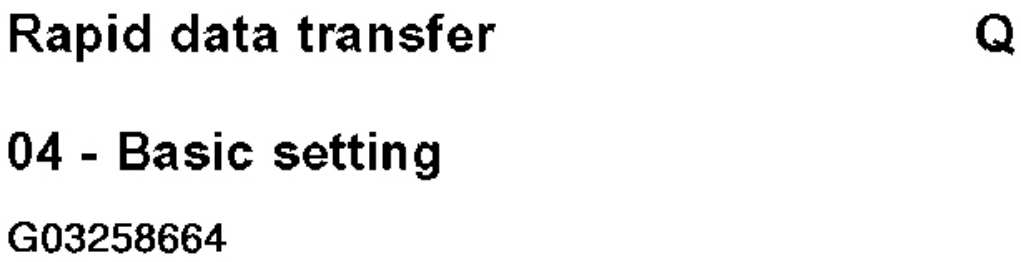


Fig. 12: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Fuse holder is located behind access panel at far left end of dash.

Test sequence

- Switch on ignition: The emissions MIL must light up.

If emissions MIL does not light up when ignition is switched on:

- Switch ignition off.
- Check wire from ECM to emissions MIL as follows:
- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .

Vehicles with engine code AEG

- Bridge sockets 2 + 17 of test box with the respective adapter cables.

Vehicles with engine code AVH, AZG and BDC

- Bridge sockets 2 + 47 of test box with the respective adapter cables.

Continuation for all vehicles

- Switch on ignition: Emissions MIL must light up.

If Malfunction Indicator Lamp (MIL) does not light up:

- Switch ignition off.
- Remove instrument cluster;

See **INSTRUMENT CLUSTER** .

- Check wire connection from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL) -K83- according to wiring diagram:

See appropriate System Wiring Diagram article.

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

If emissions MIL lights up when ignition is switched on:

- Start engine and let run at idle: Emissions MIL must go out after a few seconds.

If Malfunction Indicator Lamp (MIL) does not go out:

- Switch ignition off.
- Remove instrument cluster:

See **INSTRUMENT CLUSTER** .

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .

Vehicles with engine code AEG

- Check wire connection between test box socket 17 and instrument cluster for short circuit to Ground (GND) according to wiring diagram:

See appropriate System Wiring Diagram article.

Vehicles with engine code AVH, AZG and BDC

- Check wire connection between test box socket 47 and instrument cluster for short circuit to Ground (GND) according to wiring diagram:

See appropriate System Wiring Diagram article.

Continuation for all vehicles

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

DIAGNOSTIC MODE, SELECTING

Recommended special tools and equipment

- VAS 5052 Vehicle Diagnostic and Information System with

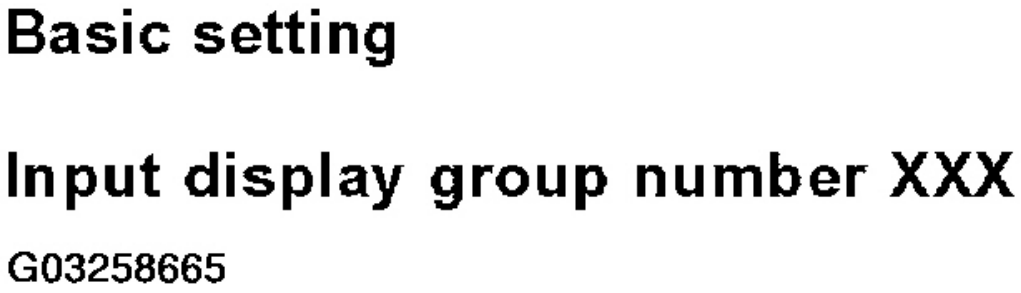


Fig. 13: Identifying VAS 5052 Vehicle Diagnostic And Information System (Selecting Diagnostic Mode)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- VAS 5052/3 diagnostic cable

Address word 33 - On-Board Diagnostic (OBD)

Function

Via the diagnostic tester, different diagnostic modes can be selected under "address word 33 - On-Board Diagnostic (OBD)".

The following diagnostic modes monitor all components and systems which influence the emission quality.

Diagnostic mode 1: Check measured values

Requirement

- Coolant temperature must be at least 80° C, PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition, switch on ignition or start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- Select the desired measured values "PID XX".

NOTE:

- **The specified values for the respective measuring values can be found at the respective component- and function tests.**
- **The following list only serves as an overview.**
- **The measuring values are sorted according to the PID (parameter-identifications).**

PID DISPLAY MEASURING VALUES (DIAGNOSTIC MODE 1)

PID	Display measuring values
01:	Monitoring status since erasing DTC memory
02:	DTC • Only for vehicles with engine code AEG
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Valve timing adjustment at 1. cyl. to "advance"
15:	Intake Air Temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)
18:	Availability status of secondary air
21:	Bank 1 - sensor 2
28:	OBD requirement for which this vehicle is designed

Vehicles with engine code AEG

If DTCs are displayed in "PID 02":

- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2xxx-DTCs** .

Continuation for all vehicles

- End diagnosis and switch ignition off.

Diagnostic mode 2: Checking operating conditions

Function

This diagnostic mode displays the operating conditions at which an emission relevant malfunction was detected and stored by the Engine Control Module (ECM).

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition: switch on ignition or start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 2: Check operating conditions."
- Select the desired operating condition "PID XX".

NOTE: The operating conditions are sorted by the PID (parameter-identifications).

PID AND DISPLAY OPERATING CONDITIONS (DIAGNOSTIC MODE 2)

PID	Display operating conditions
02:	DTC which triggered the current reception of all control module information • Only for vehicles with engine code AEG
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline-air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed

Vehicles with engine code AEG

If DTCs are displayed in "PID 02":

- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2XXX-DTCS** .

Continuation for all vehicles

- End diagnosis and switch ignition off.

Diagnostic mode 3: Check DTC Memory

Function

This diagnostic mode indicates all stored DTCs of components and systems which are emission relevant.

Malfunction Indicator Lamp (MIL) in instrument cluster lights up for one DTC entry.

SAE Diagnostic Trouble Codes (DTCs)

The DTC always consists of a 5-digit alphanumeric value with the following meaning:

Component group:

- Pxxxx = DTC for drivetrain

Norm-Code:

- P0xxx = DTCs defined by SAE with specified malfunction texts
- P1xxx = additional emission relevant DTCs provided by manufacturer
- P2xxx = DTCs defined by SAE with specified texts, from MY 2000
- P3xxx = additional emissions relevant DTCs provided by manufacturer from MY 2000

System group:

- Px0xx = Fuel and air ratio and additional emission regulations
- Px1xx = Fuel and air ratio
- Px2xx = Fuel and air ratio
- Px3xx = Ignition system
- Px4xx = additional emission regulation
- Px5xx = Speed and idle control
- Px6xx = Control module and output signals
- Px7xx = Transmission
- Px8xx = Transmission
- Px9xx = Control modules, input and output signals

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- Operate starter for approx. 6 seconds. Do not switch ignition off afterward.
- Under address word 33, select "Diagnostic mode 3:, Check DTC memory."

The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.
- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .

- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2xxx-DTCs** .
- SAE P3xxx-DTCs. See **SAE P3xxx-DTCs** .

NOTE:

- **The DTC table is sorted by SAE code.**
- **"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.**
- **"Emission"-relevant malfunctions are additionally indicated in the instrument cluster via the Malfunction Indicator Lamp (MIL).**
- **In Diagnostic mode 2, it can be determined at which operating condition a malfunction was detected and stored by the Engine Control Module (ECM). See DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS .**
- **Erase DTC memory after repairing malfunction. See DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Display example:

P0444 Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- Open circuit

Explanation:

- P0444 = SAE diagnostic trouble code (malfunction identification number)
- Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- malfunctioning wiring path or malfunctioning component
- Open circuit = Malfunction type as text

Diagnostic mode 4: Reset/erase diagnostic data

Function

This diagnostic mode performs the following functions:

- all emission relevant malfunctions in DTC memory will be erased,
- the operating conditions at which a malfunction was stored will be reset. See **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS** .
- all adaptation values are being reset,
- all test results of the diagnostic functions are being reset.

Requirement

- DTC memory was checked. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 4: Reset/erase diagnostic data."

Erased or reset:

- Number and content of the DTC memories,
- Operating conditions,
- Adaptation values,
- Test results.

- End diagnosis and switch ignition off.
- Generate readiness code. See **READINESS CODE, GENERATING** .

Diagnostic mode 5: Check output of oxygen sensor signals

Function

The static values of the oxygen sensors are indicated via this diagnostic mode.

The values of the individual oxygen sensor signal outputs must reach the specified value or must be within the min.- and max.-limits.

Requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

- Coolant temperature must be at least 80 °C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 5: Check output of oxygen sensor signals".
- Select the desired output of oxygen sensor signals "Test-ID XX"

EVALUATION OF OUTPUT OF OXYGEN SENSOR SIGNALS (DIAGNOSTIC MODE 5)

Test-ID:	Evaluation of output of oxygen sensor signals	Vehicles with engine code	
		AEG	AVH, AZG, BDC
01	Bank 1 sensor 2: rich to lean sensor barrier voltage	-	See **Evaluation test-ID 09: Time period between sensor shift procedures (Vehicles with engine code AEG)**
02	Bank 1 sensor 2: lean to rich sensor barrier voltage	-	See **Evaluation test-ID 02 Bank 1 Sensor 2: lean to rich sensor barrier voltage (Vehicles with engine code AVH, AZG, BDC)**
07	Minimum voltage at sensor for test cycle	See **Evaluation test-ID 07: Minimum voltage at sensor for test cycle (Vehicles with engine code AEG)**	See **Evaluation test-ID 07 Bank 1 Sensor 2: Minimum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)**
08	Maximum voltage at sensor for test cycle	See **Evaluation test-ID 08: Maximum voltage at sensor for test cycle (Vehicles with engine code AEG)**	See **Evaluation test-ID 08 Bank 1 Sensor 2: Maximum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)**
09	Time period between sensor shift procedures	See **Evaluation test-ID 09: Time period between sensor shift procedures (Vehicles with engine code AEG)**	-
129	Bank 1 sensor 1: Actual value of oxygen sensor voltage	-	See **Evaluation test-ID 129 Bank 1 Sensor 1: Actual value of oxygen sensor voltage (Vehicles with engine code AVH, AZG, BDC)**
130	Bank 1 sensor 1: Control barrier voltage	-	See **Evaluation test-ID 130 Bank 1 Sensor 1: Control barrier voltage (Vehicles with engine code AVH, AZG, BDC)**
131	Bank 1 sensor 1: Dynamic	-	See **Evaluation test-ID 131 Bank 1**

	value		**Sensor 1: Dynamic value (Vehicles with engine code AVH, AZG, BDC)**
132	Bank 1 sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2)	-	See **Evaluation test-ID 132 Bank 1 Sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2) (Vehicles with engine code AVH, AZG, BDC)**

- End diagnosis and switch ignition off.

Evaluation test-ID 07: Minimum voltage at sensor for test cycle (Vehicles with engine code AEG)

EVALUATION TEST-ID 07: MINIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (ENGINE CODE AEG)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	1	80
Bank 1 sensor 2	1	80

If the specified value is not reached:

- Short circuit to Ground (GND) in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:

- Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

- Short circuit to B+ or open circuit in wiring in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

Evaluation test-ID 08: Maximum voltage at sensor for test cycle (Vehicles with engine code AEG)

EVALUATION TEST-ID 08: MAXIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (ENGINE AEG)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	100	190
Bank 1 sensor 2	100	190

If the specified value is not reached:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:
- Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Short circuit to Ground (GND) or open circuit in wiring in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Short circuit to B+ in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

Evaluation test-ID 09: Time period between sensor shift procedures (Vehicles with engine code AEG)

EVALUATION TEST-ID 09: TIME PERIOD BETWEEN SENSOR SHIFT PROCEDURES (ENGINE AEG)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0	250

If the specified value is exceeded:

- Oxygen sensor faulty:

- Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .

Evaluation test-ID 01 Bank 1 Sensor 2: rich to lean sensor barrier voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 01 BANK 1 SENSOR 2: RICH TO LEAN SENSOR BARRIER VOLTAGE (AVH, AZG, BDC)

Oxygen sensor	**Specified value:**
Bank 1 sensor 2	Fixed value: 0.600 V

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) 2 Bank 1 Behind Three Way Catalytic Converter (TWC) -G130-. See item 11 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 02 Bank 1 Sensor 2: lean to rich sensor barrier voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 02 BANK 1 SENSOR 2: LEAN TO RICH SENSOR BARRIER VOLTAGE (AVH, AZG, BDC)

Oxygen sensor	**Specified value:**
Bank 1 sensor 2	Fixed value: 0.600 V

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) 2 Bank 1 Behind Three Way Catalytic Converter (TWC) -G130-. See item 11 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 07 Bank 1 Sensor 2: Minimum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 07 BANK 1 SENSOR 2: MINIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 2	0,000	0,501

If the specified value is exceeded:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:

- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

- Short circuit to B+ or open circuit in wiring in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 08 Bank 1 Sensor 2: Maximum voltage at sensor for test cycle (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 08 BANK 1 SENSOR 2: MAXIMUM VOLTAGE AT SENSOR FOR TEST CYCLE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 2	0,699	1,048

If the specified value is not reached:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:

- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

- Short circuit to Ground (GND) or open circuit in wiring in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Short circuit to B+ in oxygen sensor or in wire:

- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 129 Bank 1 Sensor 1: Actual value of oxygen sensor voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 129 BANK 1 SENSOR 1: ACTUAL VALUE OF OXYGEN SENSOR VOLTAGE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0,648	1,992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 130 Bank 1 Sensor 1: Control barrier voltage (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 130 BANK 1 SENSOR 1: CONTROL BARRIER VOLTAGE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0,648	1,992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 131 Bank 1 Sensor 1: Dynamic value (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 131 BANK 1 SENSOR 1: DYNAMIC VALUE (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	0,1	3,0

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Evaluation test-ID 132 Bank 1 Sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2) (Vehicles with engine code AVH, AZG, BDC)

EVALUATION TEST-ID 132 BANK 1 SENSOR 1: OXYGEN SENSOR SHIFT VIA OXYGEN SENSOR CONTROL (AVH, AZG, BDC)

	Specified value:	
Oxygen sensor	**min.**	**max.**
Bank 1 sensor 1	-0,03	0,03

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) 1 Bank 1 -G39- before catalytic converter. See item 2 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Diagnostic mode 6: Check test results of components that are not continuously monitored

Function

This diagnostic mode displays the test results of emission relevant components and systems which are not continuously monitored.

The values of the individual test results must reach the specified value or must be within the min.- and max.-limits.

DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS NOT CONTINUOUSLY MONITORED

Test-ID	Component, System	Test
01:	Catalytic converter	See **TEST-ID 01: CATALYTIC CONVERTER**
03:	Secondary Air Injection (AIR) system	See **Test-ID 03: Secondary Air Injection (AIR) system**
05:	Tank ventilation system	See **Test-ID 05: Tank ventilation system**

Test-ID 01: Catalytic converter

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 01: Catalytic converter".
- Check specified values at idle.

EVALUATION TEST-ID 01: CATALYTIC CONVERTER

	AEG		AVH, AZG, BDC	
	Specified value:		Specified value:	
Vehicles with engine code	min.	max.	min.	max.
Catalytic converter monitoring bank 1, aging value				

• Up to model year 1999	-	2.00	-	-
• Up to model year 2000	-	0.35	-	-
• From model year 2001	-	-	0.90	-
• From model year 2003	-	-	0.90	-
Catalytic converter monitoring bank 1, aging value, short test				
• Up to model year 1999	-	2.00	-	-
• Up to model year 2000	-	0.44	-	-
• From model year 2001	-	-	0.80	-
• From model year 2003	-	-	0.80	-

- End diagnosis and switch ignition off.

If specified values are not obtained:

- Replace the front exhaust pipe with catalytic converter:

- Vehicles with engine code AEG. See item 13 in **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** .
- Vehicles with engine code AVH, AZG, BDC. See item 10 in **EXHAUST MANIFOLD, FRONT EXHAUST PIPE WITH THREE WAY CATALYTIC CONVERTER (TWC) AND ATTACHMENTS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .

Continuation for all vehicles

- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 03: Secondary Air Injection (AIR) system

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".

- Select the "Test-ID 03: Secondary Air Injection (AIR) system"
- Check specified values at idle.

EVALUATION TEST-ID 03: SECONDARY AIR INJECTION (AIR) SYSTEM

Vehicles with engine code	AEG		AVH		AZG, BDC	
	Specified value:		Specified value:		Specified value:	
	min.	max.	min.	max.	min.	max.
reduced secondary air mass bank 1	32.00	-	0.20	-	0.35	-
very small secondary air mass bank 1, short test	-	-	0.00	-	0.60	-

- End diagnosis and switch ignition off.

If the specified values are not reached:

- Check secondary air system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Secondary Air Injection (AIR) Pump Motor -V101-. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** .
- Check combination valve. See **COMBINATION VALVE, CHECKING** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Check Secondary Air Injection (AIR) Pump Motor -V101-. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 05: Tank ventilation system

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110 °C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Read readiness code. See **READ READINESS CODE** .

- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 05: Tank ventilation system".
- Check specified values at idle.

EVALUATION TEST-ID 05: TANK VENTILATION SYSTEM (1 Of 2)

Vehicles with engine code	AEG		AVH, AZG, BDC	
	Specified value:		Specified value:	
Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-	**min.**	**max.**	**min.**	**max.**
Passive test (can only check OK)	-	-	0,1484	-
Active test: Deviation of oxygen sensor control in direction "lean" (can only check OK), short test	-	246,000	0,070	-
Active test: Deviation of oxygen sensor control in direction "rich" (can only check OK), short test	10,000	-	-0,070	-
Active test: Air balance at idle OK, also short test	-	-	32,900	-
Active test: Air balance at idle not OK, also short test	-	-	32,900	-

EVALUATION TEST-ID 05: TANK VENTILATION SYSTEM (2 Of 2)

Vehicles with engine code	AEG		AVH, AZG Up to model year 2002		AVH, AZG, BDC From model year 2002	
	Specified value:		Specified value:		Specified value:	
Tank seal	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**
Large/small leak	-	-	1,90..0,95	-	1,90	-
Reed contact not closed	-	-	-	1,00	-	0,5
Reed contact does not open	-	-	-	25,00	-	30,00
Tank ventilation system not OK during initial flush	-	-	-	-	0	-
Pinhole leak	-	-	1,90..0,00	-	5,8	-

If the specified values are exceeded:

- EVAP canister system, checking for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR**

PROPER SEAL .

- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak Detection Pump (LDP) -V144-, checking. See **CHECK LEAK DETECTION PUMP (LDP)** .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Test-ID 09: Engine Coolant Temperature (ECT) Sensor -G62- (Vehicles with engine code AVH, AZG, BDC)

Test requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test until a coolant temperature of 80 to 100° C has been reached. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Observe the safety precautions that apply to road tests. See **SAFETY PRECAUTIONS** .

- Switch ignition off.
- Start engine at a coolant temperature of 80 to 90° C and let it run at idle.
- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test-ID 09: Engine Coolant Temperature (ECT) sensor".
- Check specified values at idle.

EVALUATION TEST-ID 09: ECT SENSOR

	Specified value:	
Engine Coolant Temperature (ECT) Sensor -G62-	**min.**	**max.**
• Coolant temperature	80° C	115° C

- End diagnosis and switch ignition off.

If specified value is not obtained:

- Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** .
- Check thermostat: See applicable repair manual.

Diagnostic mode 7: Check test results of components that are continuously monitored

Function

This diagnostic mode indicates all stored DTCs of components and systems which are continuously monitored.

Requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- Operate starter for approx. 6 seconds. Do not switch ignition off afterward.
- Under address word 33, select "Diagnostic mode 7: Check test results of components that are continuously monitored".

The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.
- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs. See **SAE P0xxx-DTCs** .
- SAE P1xxx-DTCs. See **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs. See **SAE P2XXX-DTCS** .
- SAE P3xxx-DTCs. See **SAE P3XXX-DTCS** .

NOTE:

- **The DTC table is sorted by SAE codes.**
- **"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.**

- **Erase DTC memory after repairing malfunction. See DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Diagnostic mode 8: Tank leak test

Function

This diagnostic mode checks the fuel system for leaks.

NOTE:

- **The Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- and Leak Detection Pump (LDP) -V144- seal the tank system.**
- **Pressure (max. 70 mbar) can be applied to the fuel system via the test connection (in engine compartment, right) and via engine leak detection spray (e.g.: G 001 800 A1) leaks can be detected.**

Test requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .
- Intake air temperature must not be above the maximum of 60° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Function test

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle for at least 15 minutes.
- Under address word 33, select "Diagnostic mode 8: Tank leak test".
- Select measuring value "Test -ID 01: Tank leak test".
- Check specified value of tank leak test at idle.

EVALUATION TEST-ID 01: TANK LEAK TEST

Tank leak test	Specified value:
• Test function is being initiated, please wait • Test function aborted • Test function active • Test function off	Test function active

NOTE:

- **During tank leak test, Engine Control Module (ECM) limits "test function active" to approx. 12 minutes.**
- **If the accelerator pedal is depressed during the test, the test will be**

aborted.

- **To repeat the tank leak test, switch ignition off and start engine again and let run at idle for at least 15 minutes.**

If specified value is obtained:

- End diagnosis and switch ignition off.

If specified value is not obtained:

- EVAP canister system, checking for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak Detection Pump (LDP) -V144-, checking. See **CHECK LEAK DETECTION PUMP (LDP)** .

Diagnostic mode 9: Vehicle information

Function

In this diagnostic mode, vehicle specific diagnostic data such as e.g. the control module versions will be displayed.

Requirement

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Switch ignition on.
- Under address word 33, select "Diagnostic mode 9: vehicle information".
- Select desired vehicle information "Test-ID XX".

DISPLAY VEHICLE INFORMATION

Test- ID	Diagnostic text
04:	Calibration identification, example: • 06A906032MC4622 Engine Control Module (ECM) identification
06:	CVN (control module-check sum), example: • E80034 the check sum is different for every control module version • No results

- End diagnosis and switch ignition off.

READINESS CODE

Function

The readiness code is an 8 digit number block that indicates the status of emission relevant diagnostics.

When the diagnostic for a system (e.g.: secondary air system) has run through successfully, the respective digit of the number block is set from 1 to 0.

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an emissions relevant system, the readiness code should be generated via a road test to ensure that these systems are working according to specifications. If a malfunction is recognized during diagnostic, it is stored in DTC memory.

The readiness code is erased every time DTC memory is erased or when voltage supply is interrupted. DTC memory should therefore only be erased when there are DTCs stored.

Read readiness code

Requirements

- There must not be any DTCs stored in DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80° C **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- select desired measuring value "PID 01".
- Observe the right 8-digit number block:

If all diagnoses have run through successfully, the 8-digit number block Specified value: "00000000" must be displayed.

Evaluation PID 01: System status-information (right 8-digit number block:)

EVALUATION PID 01: SYSTEM STATUS-INFORMATION

Meaning if display position = 0								
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Diagnostic function**
0								Exhaust gas recirculation OK

								• not available/always "0"
	0							Oxygen sensor heater OK
		0						Oxygen sensors OK
			0					A/C system OK • not available/always "0"
				0				Secondary Air Injection (AIR) system OK
					0			EVAP canister system (tank ventilation system) OK
						0		Catalytic converter heater OK • not available/always "0"
							0	Catalytic converter OK

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Generate readiness code. See **READINESS CODE, GENERATING** .

Readiness code, generating

Requirements

- The respective fuses of the Motronic fuel injection and ignition system must be OK:

NOTE: Fuse holder is located behind access panel at far left end of dash.

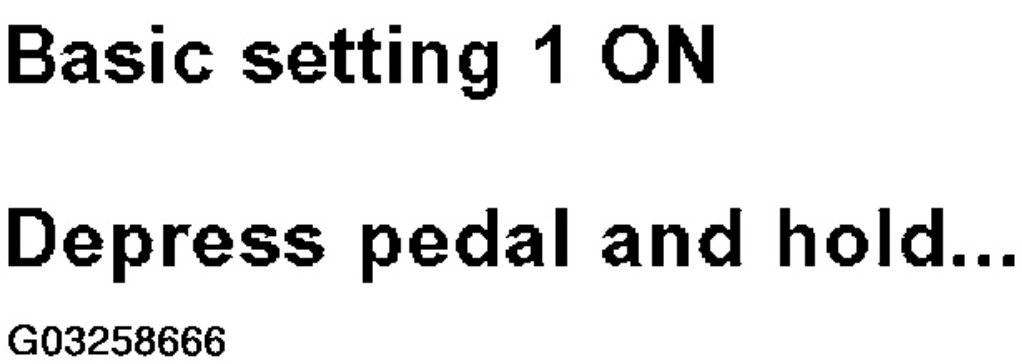


Fig. 14: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.

- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- There must not be any DTCs stored in DTC memory. See **Diagnostic mode 3: Check DTC Memory** .
- Intake air temperature 5 to 35° C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Work procedure

- Connect diagnostic tester. See **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test.

The following operating condition must be met during this road test:

- Coolant temperature must reach at least 80 °C. See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

Observe the safety precautions that apply to road tests. See **SAFETY PRECAUTIONS** .

Let vehicle cool off with the ignition switched off until the following condition is met:

- Coolant temperature approx. intake air temperature (5 to 35° C). See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** .

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).

- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.

NOTE:

- **Vehicle speed. See DIAGNOSTIC MODE 1: CHECK MEASURED VALUES .**
- **Engine speed. See DIAGNOSTIC MODE 1: CHECK MEASURED VALUES .**

- After 10 minutes, downshift until an engine speed of 2800 to 3500 RPM has been reached.
- Drive in deceleration mode at a speed up to approx. 1800 RPM.
- Park vehicle and let engine run at idle for 3 minutes.

- Accelerator pedal must not be operated during this time.

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let engine run at idle for 3 minutes.
- Accelerator pedal must not be operated during this time.
- Read readiness code. See **READ READINESS CODE** .

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Read readiness code. See **READ READINESS CODE** .

In 8-digit number block:

- Display position 5: Secondary Air Injection (AIR) system

and/or

- Display position 6: EVAP canister system

a 1 instead of 0 is displayed:

- Repeat complete work procedure. See **WORK PROCEDURE** .

DIAGNOSTIC TROUBLE CODE (DTC) TABLES:

SAE P0xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P0016-P0038

SAE-DTC	DTC text	Corrective action
P0016	Crankshaft Position - Camshaft Position	• Check Engine Speed (RPM) Sensor -G28-. See **CHECK ENGINE SPEED (RPM) SENSOR** .

	Correlation, Bank 1 Sensor A	• Check Camshaft Position (CMP) Sensor -G40-. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
P0030	HO2S Heater Control Circuit, Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P0031	HO2S Heater Control Circuit Low, Bank 1 Sensor 1	
P0032	HO2S Heater Control Circuit High, Bank 1 Sensor 1	
P0036	HO2S Heater Control Circuit, Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .
P0037	HO2S Heater Control Circuit Low, Bank 1 Sensor 2	
P0038	HO2S Heater Control Circuit High, Bank 1 Sensor 2	

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0101-P0113

SAE-DTC	DTC text	Corrective action
P0101	Mass or Volume Air Flow Circuit Range/Performance	• Check Mass Air Flow (MAF) Sensor -G70-. See **MASS AIR FLOW (MAF) SENSOR, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .
P0102	Mass or Volume Air Flow Circuit Low Input	
P0103	Mass or Volume Air Flow Circuit High Input	
P0112	Intake Air Temperature Sensor 1 Circuit Low	• Check Intake Air Temperature (IAT) Sensor -G42-. See **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR** .
P0113	Intake Air Temperature Sensor 1 Circuit High	

DIAGNOSTIC TROUBLE CODE P0116-P0123

SAE-DTC	DTC text	Corrective action
P0116	Engine Coolant Temperature Circuit Range/Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** .
P0117	Engine Coolant Temperature	

	Circuit Low	• Check thermostat: See **COOLING SYSTEM COMPONENTS - ENGINE SIDE, REMOVING AND INSTALLING** .
P0118	Engine Coolant Temperature Circuit High	
P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	

DIAGNOSTIC TROUBLE CODE P0130-P0135

SAE-DTC	DTC text	Corrective action
P0130	O2 Sensor Circuit, Bank 1 Sensor 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P0131	O2 Sensor Circuit Low Voltage, Bank 1 Sensor 1	
P0132	O2 Sensor Circuit High Voltage, Bank 1 Sensor 1	
P0133	O2 Sensor Circuit Slow Response, Bank 1 Sensor 1	
P0134	O2 Sensor Circuit No Activity Detected, Bank 1 Sensor 1	
P0135	O2 Sensor Heater Circuit, Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

DIAGNOSTIC TROUBLE CODE P0136-P0141

SAE-DTC	DTC text	Corrective action
P0136	O2 Sensor Circuit, Bank 1 Sensor 2	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND**
P0137	O2 Sensor Circuit	

	Low Voltage, Bank 1 Sensor 2	**CATALYTIC CONVERTER** .
P0138	O2 Sensor Circuit High Voltage, Bank 1 Sensor 2	
P0139	O2 Sensor Circuit Slow Response, Bank 1 Sensor 2	
P0140	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	
P0141	O2 Sensor Heater Circuit, Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

DIAGNOSTIC TROUBLE CODE P0170

SAE-DTC	DTC text	Corrective action
P0170	Fuel Trim, Bank 1	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P0171

SAE-DTC	DTC text	Corrective action
P0171	System Too Lean, Bank 1	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .

		• Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P0172

SAE-DTC	DTC text	Corrective action
P0172	System Too Rich, Bank 1	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0201-P0223

SAE-DTC	DTC text	Corrective action
P0201	Injector Circuit/Open - Cylinder 1	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** .
P0202	Injector Circuit/Open - Cylinder 2	
P0203	Injector Circuit/Open - Cylinder 3	
P0204	Injector Circuit/Open - Cylinder 4	
P0221	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	

DIAGNOSTIC TROUBLE CODE P0226-P0230

SAE-DTC	DTC text	Corrective action
P0226	Throttle/Pedal Position Sensor/Switch "C" Circuit Range/Performance	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P0227	Throttle/Pedal Position Sensor/Switch "C" Circuit Low	
P0228	Throttle/Pedal Position Sensor/Switch "C" Circuit High	
P0230	Fuel Pump Primary Circuit	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram: See appropriate System Wiring Diagram article.

DIAGNOSTIC TROUBLE CODE P0261-P0271

SAE-DTC	DTC text	Corrective action
P0261	Cylinder 1 Injector Circuit Low	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-). See **FUEL INJECTORS, CHECKING** .
P0262	Cylinder 1 Injector Circuit High	
P0264	Cylinder 2 Injector Circuit Low	
P0265	Cylinder 2 Injector Circuit High	
P0267	Cylinder 3 Injector Circuit Low	
P0268	Cylinder 3 Injector Circuit High	
P0270	Cylinder 4 Injector Circuit Low	
P0271	Cylinder 4 Injector Circuit High	

Ignition system

DIAGNOSTIC TROUBLE CODE P0300-P0304

SAE-DTC	DTC text	Corrective action
P0300	Random/Multiple Cylinder Misfire Detected	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check spark plugs. See **TEST DATA, SPARK PLUGS** .

P0301	Cylinder 1 Misfire Detected	Vehicles with engine code AEG: • Check Ignition Coil -N152-. See **CHECKING IGNITION COIL (VEHICLES WITH ENGINE CODE AEG)** . Vehicles with engine code AVH, AZG, BDC: • Check ignition coils with power output stages (-N70-, -N127-, -N291-, - N292-). See **CHECKING IGNITION COILS WITH POWER OUTPUT STAGES (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** . • Check intake system for leaks. See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .
P0302	Cylinder 2 Misfire Detected	
P0303	Cylinder 3 Misfire Detected	
P0304	Cylinder 4 Misfire Detected	

DIAGNOSTIC TROUBLE CODE P0321 - P0324

SAE-DTC	DTC text	Corrective action
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	• Check Engine Speed (RPM) Sensor -G28-. See **CHECK ENGINE SPEED (RPM) SENSOR** .
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	
P0324	Knock Control System Error	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-). See **CHECK KNOCK SENSORS** . • Loosen knock sensors and tighten to 20 Nm again • Repair abnormal engine noise (components loose, bracket/bolts broken) • Change fuel types

DIAGNOSTIC TROUBLE CODE P0327-P0333

SAE-DTC	DTC text	Corrective action
P0327	Knock Sensor 1 Circuit Low, Bank 1 or Single Sensor	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-). See **CHECK KNOCK SENSORS** . • Loosen knock sensors and tighten to 20 Nm again
P0328	Knock Sensor 1 Circuit High, Bank 1 or Single Sensor	
P0332	Knock Sensor 2 Circuit Low, Bank 2	
P0333	Knock Sensor 2 Circuit High, Bank 2	

DIAGNOSTIC TROUBLE CODE P0340-P0343

SAE-DTC	DTC text	Corrective action
P0340	Camshaft Position Sensor "A" Circuit, Bank 1 or Single Sensor	• Check Camshaft Position (CMP) Sensor -G40-. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
P0341	Camshaft Position Sensor "A" Circuit Range/Performance, Bank 1 or Single Sensor	
P0342	Camshaft Position Sensor "A" Circuit Low, Bank 1 or Single Sensor	
P0343	Camshaft Position Sensor "A" Circuit High, Bank 1 or Single Sensor	

DIAGNOSTIC TROUBLE CODE P0351-P0354

SAE-DTC	DTC text	Corrective action
P0351	Ignition Coil "A" Primary/Secondary Circuit	Vehicles with engine code AEG: • Check Ignition Coil -N152-. See **CHECKING IGNITION COIL (VEHICLES WITH ENGINE CODE AEG)** . Vehicles with engine code AVH, AZG, BDC • Check ignition coils with power output stages (-N70-, -N127-, -N291-, -N292-). See **CHECKING IGNITION COILS WITH POWER OUTPUT STAGES (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P0352	Ignition Coil "B" Primary/Secondary Circuit	
P0353	Ignition Coil "C" Primary/Secondary Circuit	
P0354	Ignition Coil "D" Primary/Secondary Circuit	

Additional emissions regulation

DIAGNOSTIC TROUBLE CODE P0411

SAE-DTC	DTC text	Corrective action
P0411	Secondary Air Injection System Incorrect Flow Detected	• Check Secondary Air Injection (AIR) Pump Motor -V101-. See **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** . • Check hoses and connecting pipes to and between components. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check combination valve. See **COMBINATION VALVE, CHECKING** . Vehicles with engine code AEG:

		• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .

DIAGNOSTIC TROUBLE CODE P0412-P0422

SAE-DTC	DTC text	Corrective action
P0412	Secondary Air Injection System Switching Valve "A" Circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	
P0418	Secondary Air Injection System Control "A" Circuit	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-
P0420	Catalyst System Efficiency Below Threshold, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P0422	Main Catalyst Efficiency Below Threshold, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check catalytic converter. See **CATALYTIC CONVERTER, CHECKING** .

DIAGNOSTIC TROUBLE CODE P0440-P0456

SAE-DTC	DTC text	Corrective action
P0440	Evaporative Emission System	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** . • EVAP canister system, check for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
P0441	Evaporative Emission System Incorrect Purge Flow	
P0442	Evaporative Emission System Leak Detected (small leak)	

P0444	Evaporative Emission System Purge Control Valve Circuit Open	
P0445	Evaporative Emission System Purge Control Valve Circuit Shorted	
P0455	Evaporative Emission System Leak Detected (large leak)	
P0456	Evaporative Emission System Leak Detected (very small leak)	

Speed and idle control

DIAGNOSTIC TROUBLE CODE P0501-P0510

SAE-DTC	DTC text	Corrective action
P0501	Vehicle Speed Sensor "A" Range/Performance	• Check speed signal. See **SPEED SIGNAL, CHECKING** .
P0506	Idle Air Control System RPM Lower Than Expected	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P0507	Idle Air Control System RPM Higher Than Expected	
P0510	Closed Throttle Position Switch	

Control module and output signals

DIAGNOSTIC TROUBLE CODE P0600-P0606

SAE-DTC	DTC text	Corrective action
P0600	Serial Communication Link	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P0601	Internal Control Module Memory Check Sum Error	• Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .
P0602	Control Module Programming Error	
P0604	Internal Control Module Random Access Memory (RAM) Error	
P0605	Internal Control Module Read Only Memory (ROM)	

	Error	
P0606	ECM/PCM Processor	

DIAGNOSTIC TROUBLE CODE P0638 - P0687

SAE-DTC	DTC text	Corrective action
P0638	Throttle Actuator Control Range/Performance, Bank 1	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** . • Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P0650	Malfunction Indicator Lamp (MIL) Control Circuit	• Check emissions Malfunction Indicator Lamp (MIL) -K83-. See **MALFUNCTION INDICATOR LAMP (MIL) IN INSTRUMENT CLUSTER, CHECKING** .
P0685	ECM/PCM Power Relay Control Circuit /Open	• Check voltage supply of Motronic Engine Control Module (ECM) -J220-. See **VOLTAGE SUPPLY FOR ENGINE CONTROL MODULE (ECM)** . • Check Activation of Motronic Engine Control Module (ECM) Power Supply Relay -J271- according to wiring diagram: See appropriate System Wiring Diagram article.
P0686	ECM/PCM Power Relay Control Circuit Low	
P0687	ECM/PCM Power Relay Control Circuit High	

transmission

DIAGNOSTIC TROUBLE CODE P0704

SAE-DTC	DTC text	Corrective action
P0704	Clutch Switch Input Circuit Malfunction	• Check signal from Clutch Vacuum Vent Valve Switch -F36-. See **CHECKING SIGNAL FROM CLUTCH VACUUM VENT VALVE SWITCH** .

SAE P1xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1102-P1118

SAE-DTC	DTC text	Corrective action
P1102	Bank 1-sensor 1, heating circuit short to B+	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC**

P1103	Bank 1 -sensor 1, heating circuit, output too low	**CONVERTER (TWC), CHECKING** . • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P1105	Bank 1 -sensor 2, heating circuit short to B+	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1115	Bank 1 -sensor 1, heating circuit short to Ground	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1116	Bank 1 -sensor 1, heating circuit open	
P1117	Bank 1 -sensor 2, heating circuit short to Ground	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1118	Bank 1 -sensor 2, heating circuit open	

DIAGNOSTIC TROUBLE CODE P1127

SAE-DTC	DTC text	Corrective action
P1127	Bank 1, mixture adaptation (mult.) System too rich	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .

DIAGNOSTIC TROUBLE CODE P1128

SAE-DTC	DTC text	Corrective action
P1128	Bank 1, mixture adaptation (mult.) System too lean	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** .

		• Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1136

SAE-DTC	DTC text	Corrective action
P1136	Bank 1, mixture adaptation (add.) system too lean	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

NOTE: add = additive, means that malfunction is only valid at closed throttle (idle).

DIAGNOSTIC TROUBLE CODE P1137

SAE-DTC	DTC text	Corrective action
P1137	Bank 1, mixture adaptation (add.) system too rich	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .

NOTE: add = additive, means that malfunction is only valid at closed throttle (idle).

DIAGNOSTIC TROUBLE CODE P1141-P1143

SAE-DTC	DTC text	Corrective action
P1141	Load detection implausible value	• Check Mass Air Flow (MAF) Sensor -G70-. See **MASS AIR FLOW (MAF) SENSOR, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** . • Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P1142	Load detection, lower limit not reached	
P1143	Load detection limit exceeded	

DIAGNOSTIC TROUBLE CODE P1151

SAE-DTC	DTC text	Corrective action
P1151	Bank 1, Long Term Fuel Trim, Range 1, Leanness Lower Limit Exceeded	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP (FP)** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1152

SAE-DTC	DTC text	Corrective action
P1152	Bank 1, Long Term Fuel Trim, Range 2, Leanness Lower Limit Exceeded	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check Fuel Pump (FP) -G6-. See **CHECK FUEL PUMP**

		(FP) . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1165-P1173

SAE-DTC	DTC text	Corrective action
P1165	Bank 1, mixture adaptation, area 1, richness limit exceeded	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
P1166	Bank 1, mixture adaptation, area 2, richness limit exceeded	
P1171	Throttle Actuation Potentiometer Sign.2, Range/Performance	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P1172	Throttle Actuation Potentiometer Sign.2, Signal too low	
P1173	Throttle Actuation Potentiometer Sign.2, Signal too high	

DIAGNOSTIC TROUBLE CODE P1176

SAE-DTC	DTC text	Corrective action
P1176	Bank 1 oxygen sensor correction behind cat. control limit reached	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check intake air system for leaks (false air). See **INTAKE**

		SYSTEM FOR LEAKS (FALSE AIR), CHECKING .

DIAGNOSTIC TROUBLE CODE P1178-P1186

SAE-DTC	DTC text	Corrective action
P1178	linear Lambda probe / pump current, open	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P1179	linear Lambda probe / pump current, short to ground	
P1180	linear Lambda probe / pump current, short to B+	
P1181	linear Lambda probe / reference voltage, open	
P1182	linear Lambda probe / reference voltage, short to ground	
P1183	linear Lambda probe / reference voltage, short to B+	
P1184	linear Lambda probe / common ground wire, open	
P1185	linear Lambda probe / common ground wire, short to ground	
P1186	linear Lambda probe / common ground wire, short to B+	

DIAGNOSTIC TROUBLE CODE P1196-P1198

SAE-DTC	DTC text	Corrective action
P1196	Bank 1 -sensor 1, heating circuit electrical malfunction	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
P1198	Bank 1 -sensor 2,	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three

	heating circuit electrical malfunction	Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1213-P1228

SAE-DTC	DTC text	Corrective action
P1213	Cyl.1-Fuel Injector Circ., Short to B+	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** .
P1214	Cyl.2-Fuel Injector Circ., Short to B+	
P1215	Cyl.3-Fuel Injector Circ., Short to B+	
P1216	Cyl.4-Fuel Injector Circ., Short to B+	
P1225	Cyl.1-Fuel Injector Circ., Short to Ground	
P1226	Cyl.2-Fuel Injector Circ., Short to Ground	
P1227	Cyl.3-Fuel Injector Circ., Short to Ground	
P1228	Cyl.4-Fuel Injector Circ., Short to Ground	

DIAGNOSTIC TROUBLE CODE P1237-P1240

SAE-DTC	DTC text	Corrective action
P1237	Cyl.1-Fuel Injector Circ. Open	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-). See **FUEL INJECTORS, CHECKING** .
P1238	Cyl.2-Fuel Injector Circ. Open	
P1239	Cyl.3-Fuel Injector Circ. Open	
P1240	Cyl.4-Fuel Injector Circ. Open	

DIAGNOSTIC TROUBLE CODE P1255 - P1296

SAE-		

DTC	DTC text	Corrective action
P1255	Engine Coolant Temp. Sensor Circ. Short to Ground	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check thermostat: See **COOLING SYSTEM COMPONENTS -ENGINE SIDE, REMOVING AND INSTALLING** .
P1256	Engine Coolant Temp. Sensor Circ. Open/Short to B+	
P1296	Malfunction in cooling system	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check thermostat: See **COOLING SYSTEM COMPONENTS -ENGINE SIDE, REMOVING AND INSTALLING** .

Ignition system

DIAGNOSTIC TROUBLE CODE P1300

SAE-DTC	DTC text	Corrective action
P1300	Misfire detected, Reason: Fuel level too low	• Fuel level less than 2 gallons, add fuel to tank • Check signal from sender for fuel gauge -G-. • Check wire connection between Engine Control Module (ECM) and instrument cluster according to wiring diagram: See appropriate System Wiring Diagram article.

DIAGNOSTIC TROUBLE CODE P1335 - P1340

SAE-DTC	DTC text	Corrective action
P1335	Engine torque monitoring 2 control limit exceeded	• Check Mass Air Flow (MAF) Sensor -G70-. See **MASS AIR FLOW (MAF) SENSOR, CHECKING** .
P1336	Engine torque monitoring control limit exceeded	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check Intake Air Temperature (IAT) Sensor -G42-. See **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR** .
P1340	Camshaft/Crankshaft Position Sensor Signals Out of Sequence	• Check Camshaft Position (CMP) Sensor -G40-. See **CHECK CAMSHAFT POSITION (CMP)**

		SENSOR . • Check Engine Speed (RPM) Sensor -G28-. See **CHECK ENGINE SPEED (RPM) SENSOR** .

Additional emissions regulation

DIAGNOSTIC TROUBLE CODE P1410-P1426

SAE-DTC	DTC text	Corrective action
P1410	Tank Ventilation Valve Circ., Short to B+	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
P1420	Secondary Air Injection (AIR) solenoid valve - N112- electrical malfunction in circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .
P1421	Secondary Air Injection (AIR) solenoid valve - N112- short circuit to Ground (GND)	
P1422	Secondary Air Injection (AIR) solenoid valve - N112- short circuit to B+	
P1424	Bank 1, Secondary Air Injection (AIR) system, leak detected	• Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** .
P1425	Tank Vent. Valve, Short to Ground	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
P1426	EVAP canister purge regulator valve -N80- open circuit	

DIAGNOSTIC TROUBLE CODE P1432-P1435

SAE-DTC	DTC text	Corrective action
P1432	Secondary Air Injection (AIR) solenoid valve - N112- open circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-. See **SECONDARY AIR INJECTION (AIR) SOLENOID VALVE (VEHICLES WITH ENGINE CODE AEG UP TO 05.99), CHECKING** .
P1433	Secondary Air Injection (AIR) pump relay -J299- open circuit	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.
P1434	Secondary Air Injection	

	(AIR) pump relay -J299- short circuit to B+	
P1435	Secondary Air Injection (AIR) pump relay -J299- short circuit to Ground (GND)	

DIAGNOSTIC TROUBLE CODE P1450-P1452

SAE-DTC	DTC text	Corrective action
P1450	Secondary Air Injection System Circ., Short to B+	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.
P1451	Secondary Air Injection System Circ., Short to Ground	
P1452	Secondary Air Injection System, Open Circ.	

DIAGNOSTIC TROUBLE CODE P1471-P1476

SAE-DTC	DTC text	Corrective action
P1471	EVAP Emission Contr. LDP Circ., Short to B+	• Check Leak Detection Pump (LDP) -V144-. See **CHECK LEAK DETECTION PUMP (LDP)** . • EVAP canister system, check for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
P1472	EVAP Emission Contr. LDP Circ., Short to Ground	
P1473	Leak Detection Pump (LDP) tank ventilation system open circuit	
P1475	Leak Detection Pump (LDP) for tank ventilation system, malfunction / no signal	
P1476	Leak Detection Pump (LDP) tank ventilation system malfunction/vacuum too low	

DIAGNOSTIC TROUBLE CODE P1500-P1541

SAE-DTC	DTC text	Corrective action
P1500	Fuel Pump (FP) Relay -J17- electrical malfunction in circuit	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram: See appropriate System Wiring Diagram article.
P1501	Fuel Pump Relay Circ., Short to Ground	
P1502	Fuel Pump Relay Circ., Short to B+	
P1541	Fuel Pump (FP) Relay -J17- open circuit	

DIAGNOSTIC TROUBLE CODE P1542-P1580

SAE-DTC	DTC text	Corrective action
P1542	Angle sensor -1- for throttle drive (power accelerator actuation) -G187-, implausible signal	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P1543	Angle sensor -1- for throttle drive (power accelerator actuation) -G187-, signal too small	
P1544	Angle sensor -1- for throttle drive (power accelerator actuation) -G187-, signal too large	
P1545	Throttle valve regulation, malfunction	
P1558	Throttle Actuator, Electrical Malfunction	
P1559	Throttle Valve Control Module -J338-, malfunction in basic setting	
P1565	Throttle Valve Control Module -J338- lower limit not attained	
P1580	Throttle Actuator B1 Malfunction	

DIAGNOSTIC TROUBLE CODE P1582

SAE-DTC	DTC text	Corrective action
P1582	Idle Adaption at Limit	• Check fuel pressure regulator and residual pressure. See **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** . • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-). See **FUEL INJECTORS, CHECKING** . • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-. See **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** . • Check exhaust system for proper seal. See **EXHAUST SYSTEM EMISSION CONTROLS** . • Check Secondary Air Injection (AIR) system for proper seal. See **SECONDARY AIR INJECTION (AIR) SYSTEM, CHECKING FOR PROPER SEAL** . • Check vacuum lines for leaks

Control module and output signals

DIAGNOSTIC TROUBLE CODE P1626 - P1634

SAE-DTC	DTC text	Corrective action
P1626	Data-Bus Powertrain, Missing Message from TCM.	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P1630	Throttle Position (TP) sensor -G79- signal too small	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P1631	Throttle Position (TP) Sensor -G79- signal too large	
P1633	Sender -2- for accelerator pedal position -G185- signal too small	
P1634	Sender -2- for accelerator pedal position -G185- signal too large	

DIAGNOSTIC TROUBLE CODE P1635-P1681

SAE-DTC	DTC text	Corrective action
P1635	Data -Bus Powertrain, missing message from air condition control	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P1639	Throttle Position (TP) sensor -G79- and sender -2- for accelerator pedal position -G185-, implausible signal	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P1640	Control module faulty	• Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .
P1648	Data Bus Powertrain, defect	• Check terminal resistance for CAN-Bus. See **CHECKING TERMINAL RESISTANCE FOR CAN - BUS (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
P1649	Powertrain CAN-bus missing message from ABS control module	
P1650	Data Bus Powertrain, missing message from instrument panel ECM	
P1681	Contr. Unit Programming, Programming not Finished	• Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

DIAGNOSTIC TROUBLE CODE P1691-P1693

SAE-DTC	DTC text	Corrective action
P1691	Malfunction Indicator Lamp, Open	• Check emissions Malfunction Indicator Lamp (MIL) -K83-. See **MALFUNCTION INDICATOR LAMP (MIL) IN INSTRUMENT CLUSTER, CHECKING** .
P1692	Malfunction Indicator Lamp, Short to Ground	
P1693	Malfunction Indicator Lamp, Short to B+	

SAE P2xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P2096-P2097

SAE-DTC	DTC text	Corrective action
P2096	Post Catalyst Fuel Trim System Too Lean, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P2101-P2138

SAE-DTC	DTC text	Corrective action
P2101	Throttle Actuator Control Motor Circuit Range/Performance	• Check Throttle Valve Control Module -J338-. See **THROTTLE VALVE CONTROL MODULE, CHECKING** .
P2106	Throttle Actuator Control System - Forced Limited Power	
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-. See **THROTTLE POSITION (TP) SENSOR, CHECKING** .
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low	

	Input
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input
P2133	Throttle/Pedal Position Sensor/Switch "F" Circuit High Input
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation

DIAGNOSTIC TROUBLE CODE P2177-P2181

SAE-DTC	DTC text	Corrective action
P2177	System Too Lean Off Idle, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** . • Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .
P2178	System Too Rich Off Idle, Bank 1	
P2181	Cooling System Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-. See **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** . • Check thermostat: See **COOLING SYSTEM COMPONENTS -ENGINE SIDE, REMOVING AND INSTALLING** .

DIAGNOSTIC TROUBLE CODE P2187-P2192

SAE-DTC	DTC text	Corrective action
P2187	System Too Lean at Idle, Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** . • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .
P2188	System Too Rich at Idle, Bank 1	
P2191	System Too Lean at Higher Load, Bank 1	

P2192	System Too Rich at Higher Load, Bank 1	• Check intake air system for leaks (false air). See **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** .

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P2243-P2251

SAE-DTC	DTC text	Corrective action
P2243	O2 Sensor Reference Voltage Circuit/Open, Bank 1 Sensor 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC). See **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** .
P2251	O2 Sensor Negative Current Control Circuit/Open, Bank 1 Sensor 1	

Additional emissions regulation

DIAGNOSTIC TROUBLE CODE P2400-P2404

SAE-DTC	DTC text	Corrective action
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	• Check Leak Detection Pump (LDP) -V144-. See **CHECK LEAK DETECTION PUMP (LDP)** . • EVAP canister system, check for proper seal. See **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	

SAE P3xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P3211

SAE-DTC	DTC text	Corrective action
P3211	Exhaust-bank 1 sensor 1 Heater return connection	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC). See **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY**